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J. O. Snyder.
120

Frank Staart.
Wrightsville, Pa.

THE LONG-EARED SQUIRREL. *Sciurus macrotis.*

CECIL'S BOOKS

OF

NATURAL HISTORY.

PART I.—BEASTS.

PART II.—BIRDS.

PART III.—INSECTS.

BY

SELIM H. PEABODY.

Profusely Illustrated.

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HE prayeth well who loveth well
Both man and bird and beast;
He prayeth best who loveth best
All things, both great and small;
For the dear God who loveth us,
He made and loveth all.

The Rime of the Ancient Mariner.

SOMETIMES a-dropping from the sky
I heard the skylark sing;
Sometimes all little birds that are,
How they seemed to fill the sea and air
With their sweet jargoning!

The Rime of the Ancient Mariner.

AND there 's never a leaf nor a blade too mean
To be some happy creature's palace.

Lowell.

O HAPPY living things! no tongue
Their beauty might declare:
A spring of love gushed from my heart,
And I blest them unaware.

The Rime of the Ancient Mariner.

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About Squirrels.

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Class — *Mammalia*. — Feeding the young with milk.

Order — *Rodentia*. — Gnawers.

Family — *Sciuridæ*. — Squirrel-like.

Genus — *Sciurus*. — True Squirrels.

EVERY one loves the squirrel. His form is so lithe and graceful, his coat so beautiful and clean, his movements so agile, and his whole behavior so sprightly, that he is a general favorite. In autumn, when the trees are glowing with brilliant colors; while hickory-nuts, beech-nuts, and chestnuts are every where dropping among the rustling leaves; then is the carnival of squirrels.

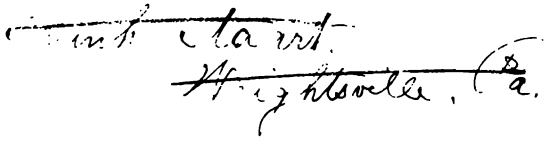
You hear a sharp, shrill chirp; and if quick enough, see in the fork, or on the rugged knot of some old oak, a bright-eyed little fellow, scolding and flirting, evidently quite vexed at your intrusion, and afraid that you will see where he means to bestow the nuts which fill his puffy cheeks. Watch him slyly and quietly, my friend, if you wish to observe him. If you approach too near, his whisking tail vanishes behind the tree, and presently you see him skipping from limb to limb, till he is lost among the distant tree tops.

Should you come upon him unawares, you would find a sleek, grey-haired little fellow, sitting erect upon his hinder feet, with his tail turned up against his back like a plume, while he is gnawing a hole into a nut which he holds in his fore paws. There, it is done, and the empty shell rattles on the ground. He looks around—sees you, chirps, whisks his tail, and—good-by.

The boys in old Greece, who wandered in the vale of Tempe, and gathered nuts on the rugged

to the tail, which is about six inches. The color of the head, back, legs, and tail, is reddish brown; the breast and belly are white; the eyes are large, dark and lively; the legs, short and strong. On the ground the motion is a succession of leaps, the tail extended and waving. When it eats, or dresses itself, sitting erect like the hare or rabbit, it uses its fore-paws as hands. It lives upon nuts, acorns, the bark of young trees, leaf-buds, and tender shoots, and does not object to the farmer's corn, if grown in the outside rows. In autumn it providently hoards away in the ground, and in holes of trees near its own nest, stores of food on which it may subsist when fruit and foliage are gone.

The squirrel makes its nest very skillfully of twigs, dry leaves, and moss, curiously interwoven, and hides it in the hollow of a decayed tree, or in the fork between the branches. In the latter case it closes up the sides and top, except a small opening to go in and out at. It defends this door from the weather by a kind



GENUS — *Tamias*, or Striped Squirrels.

The Chipping, Striped, or Ground Squirrel, or Chipmunk, *Tamias Striatus*, is a lively, familiar animal, often seen dodging about fences, walls, and the roots of trees. It is five or six inches long to the tail, which is about four inches. Its general color above is yellowish grey and brown, finely grizzled, striped on the back and sides with five longitudinal bands. It does not climb unless surprised, but makes its hole near the roots of a stump or tree, into which it carries its stores for winter, and where it stays, without once coming out, while the cold weather lasts.

GENUS — *Spermophilus*, Ground Squirrels and Gophers.

These are all burrowing animals, and are specially numerous in the West, whose broad prairies afford no forest shelter for their tree-loving cousins. With great industry and rapidity, they dig long galleries under ground, throwing out mounds of earth here and there as large as a bushel basket. So thoroughly have

these little creatures dug over the sandy prairies of Wisconsin, that the hillocks are as numerous, though not as regular, as in a corn-field.

The Striped Gopher or Leopard Spermophile, *S. tri-decem-lineatus*, is about as large as the Red Squirrel, with a tail about half the length of the body. The color is dark brown above, banded with alternate light stripes and rows of light spots, there being six stripes, and five rows of spots. It vanishes into its burrow with a chirp whenever alarmed.

GENUS — *Pteromys*, Flying Squirrels.

The common Flying Squirrel, *P. volucella*, is about five inches long to the tail, which is but little less. This little animal has a fold of skin, covered, like the rest of his body, with soft silky fur, which extends along his sides from his fore-feet to his hind-feet. When he leaps, throwing his feet out, this skin is stretched between them, and spreads like a sail on either side. In this way his buoyancy is much increased, and his whole body resembles a skin floating in the air.

He skims along like a bird on even wing, not beating the air, but gradually descending, until he alights at a place somewhat lower than that from which he sprang, and sometimes one hundred and fifty feet distant. The Flying Squirrel feeds chiefly upon the twigs of trees, and the seeds found in the cones of pine trees.

The following pleasant description of the domestic life of these animals is given by the naturalist Webber:

"Then, when I went out by myself into the deep woods, I sat down on the moss at the root of an old tree to watch for the squirrel. When every thing was still again, I would see him after a while poking his head out of the hole, snuff! snuff! Then out his head would pop to rest his chin upon his paws, and he would look all around, above and below, very cunningly, to see if all was right. Then out like a thought he would glide, and I could see his lovely brush quickly curled and spread so grandly above his head, as he sat upon a limb, still for a moment. Lo! there is another snuff-

ing nose, and then great shining eyes filling the round black knot-hole, and out another pops, and another and another. Such whisking of tails, darting along limbs, and bounding from swinging twig to rustling tree-top, until they all meet!

"Now the frolic begins in earnest, and they dart round and round the trunks, rattling the bark down as they chase each other. Their tails are spread now as wide as they can, as if they were scared; and that lady squirrel he makes love to, you may be sure, for now he has chased her out to the very end of a great high limb; and, hard pushed, here she comes right off into the air! down almost into my face — the white of her arms underneath spread wide like her stiffened tail — into the leaves head foremost, and then up and away, patter! patter! patter! Here he comes, too, sailing down after her, plump! and rattles off along the old logs and swinging vines in hot chase.

"So would they all frolic, chasing one another, and one of them would see me, and stop,

and stamp his tiny feet, and bark at me, jerking his tail in comic wrath."

In the North of Europe, the squirrels, like the birds, are said to migrate yearly, to find a warmer climate. In their journeys they march by thousands, moving straight on, over rocks, through forests, not stopping even for rivers and lakes. Indeed, were not the wonderful tales of their journeys, proved by so high authority as Linnæus, they could hardly be believed. According to that naturalist, when the army of squirrels comes to the edge of a stream or lake, they wait for a clear sky and a fair wind, and when all is ready, each one on his chosen bit of bark pushes out into the water. In this orderly manner, with all tails hoisted, the little fleets sometimes cross sheets of water several miles in width. But often they meet the fate of others "who go down to the sea in ships." The wind becomes too strong, or the waves, which were peaceful near the shore, are too rough for barks without keel or ballast, and the whole navy suffers shipwreck. The roving Laplander gath-

ers the bodies as the waves cast them ashore, and makes both flesh and skins useful.

The front or cutting teeth, which the squirrel has in common with the other members of the order *Rodentia*, or Gnawers, are worthy of notice, for they show, as indeed does every thing in nature, the care with which the Creator adapted his creatures to their peculiar mode of life. The rodents, including squirrels, rats, mice, beavers, and rabbits, have to bite through tough, hard substances, like the shells of nuts or the wood of trees, and require sharp, chisel-like teeth, which, at the same time, must be very firm and strong.

The teeth of men and most quadrupeds, are formed of hard ivory, covered with a harder coating of enamel. If they wear away by long use, all parts wear alike, leaving a flat grinding surface, and they do not grow. The front or cutting teeth of the rodents are covered only in front with enamel; this wears more slowly than the ivory, and always presents a sharp, cutting edge. The severe use to which the animal

puts his teeth, wears out even this sharp ridge of enamel, and, therefore, these teeth are made to grow constantly.

The molar, or grinding teeth of some of the rodents, as of the rat and the beaver, are formed of alternate ridges of ivory and enamel, that they may wear into rasp-like ridges, and thus grind the hard substances which they eat. The kernels of nuts which the squirrels eat are not hard, so that, while their front teeth will gnaw through a nut shell, their grinders are made like those of other quadrupeds.

In the public squares of New Haven and Philadelphia, these beautiful creatures, protected from dogs, and respected by boys, have become very tame. On a bright day in autumn, scores of waving plumes may be seen among the leaves as the squirrels chase each other in the grass, or lay up stores for the winter. Many bits of food are given by passing school-boys to the timorous fellows, that are half afraid, but still muster courage to seize the morsel offered them. Then they retreat a little way, and

munch their prize, saying "Thank you" with bright eyes, the while.

One quiet afternoon, while musing in one of the squares, I observed a grey squirrel with a nut in his cheek, evidently looking for a hiding place. Presently he stopped, pushed away the grass and began to dig with all his might. In a moment he had a hole two or three inches deep, into which he vigorously crammed the nut. When he was satisfied that it was right, he put back the earth, patted it down carefully, scratched the grass and leaves over the spot, and whisked away, with a sly wink at me, which said "Find it if you can." And sure enough, when I tried to find the spot, from which his sprightly motion had drawn my eye, I tried in vain. He had covered his work so skillfully that I could not find it, though I had watched every motion.

As I walked away I asked myself this question: Is man's reason really more valuable than the brute's instinct, if the man's reason only teaches him to lay up for old age, while

the brute knows when to lay by store for winter? Indeed the brute would seem to be most sagacious, for the waning years of others would constantly warn the man of his coming fortune, while the squirrel only saw the bright sun and falling leaves, and heard the dry leaves rustle in the whistling wind. Unless man learns to lay up treasure beyond the storehouses of this life, how is he better than the beasts that perish?

Again, I thought, would that every child, every man and woman, would imitate the earnestness of the squirrel. His work was before him and it must be done. He rested not until it was done. He did not dig a moment and then lie down to dally with the green grass or the withered leaves, he looked neither to right nor left, but wrought straight on till his work was finished; finished with such care, too, and so completely, that no broken earth, no twisted blade of grass betrayed the spot. O ye, who begin and leave unfinished, who are drawn from

well-planned schemes, by fresher novelties, ever changing, learn from my squirrel!

Still another lesson did this bright eyed monitor teach. The nut he buried he might never uncover. He, perhaps, forgot where he buried it; perhaps he wandered far away; perhaps he died; but even then the seed would show itself, springing into life, the germ of some tall tree, and so that burial be not in vain. God, in his providence, has so arranged that even the squirrels plant his forests, while concealing for themselves. Shall he not bless that which is sown, and watered, and nourished, with earnest hope and faith, as well as this chance seeding?

BEAVERS AT WORK. *Castor Canadensis.*

About Beavers.

VERTEBRATA. MAMMALIA.
ORDER — *Rodentia.* — Gnawers.
FAMILY — *Sciuridæ.* — Squirrel-like.
GENUS — *Castor* — The Beaver.

WORK like a beaver! How is that? Don't you know? It is to be up early and late; to dig, and gnaw, and scrub, and delve. To stop at nothing. If a great tree is in the way, bite it off, chip by chip. If the rock won't move, build round it, work it in, and make its firmness the strength of the wall. If the water rises, build higher. If it breaks through,

fill up the hole. Where the work is weak, make it stronger. If the winter's cold freezes it, so much the better, the wolverines can't get through. If the warm rains thaw it again, no matter, it is a good time to make repairs. That's how it is to work like a beaver.

Who is this worker? Where does he live, and what does he do?

He is second cousin to the squirrels, but is much larger. He wears a rich robe, usually chestnut color, sometimes black, made of smooth, glossy hair, and lined with the finest, warmest, ash-colored fur. He is about three feet long, and carries a broad scaly tail, which adds another foot. This tail is quite a funny fixture, of which we will say more by and by. The hind-feet are webbed, and serve to paddle it through the water quite swiftly.

The cutting teeth, which have the same peculiar shape as those of the squirrel, are very large, sharp, and strong. With them he can gnaw down large trees, or pare an apple as smoothly as if done with a knife. Before the Indians

obtained iron tools from white men, they used these teeth for chisels, and found them hard enough to cut bone, and to fashion their horn-tipped spear-heads.

The beaver is most abundant in the unsettled parts of North America, — the western territories, and Canada. He makes his home in the water, in some stream or lake. He prefers running water, because the stream floats to his house the wood that he uses, and affords him a better way of escape when attacked. He always selects a place where the water is so deep that it will not freeze to the bottom in winter. If the stream is small, and likely to become dry, either from summer's drought or winter's frost, he provides against that danger by building a dam, and filling a pond for himself.

The shape of the dam differs with the nature of the stream. If the current is slow, the dam is made straight across; if swift and strong, the dam is curved against the stream; if the deep, swift water should be near one side, the

dam will be curved there, and straight across the shallow part, where the pressure is light.

The work is built of drift-wood, and of logs of green willow, poplar, birch, and soft maple, mixed with mud and stones. The willow and poplar trees often take root and grow, sometimes forming a regularly planted hedge, so tall that birds build in the branches. Where the beavers have been long undisturbed, the dam, by constant repair, becomes a solid bank, able to withstand any force of water and ice.

A beaver dam at Shawano, Wisconsin, is from eight to ten feet high, and twelve or fifteen rods long. It is wide enough at the top to drive a team upon, and a substantial grist and saw-mill is carried by the abundant supply of water which it affords. It is just as the beavers made it, with only a sluice added to carry the water to the wheels.

The beavers cut down large trees on the bank of the stream, always taking care to make them fall into the water. Then they gnaw the limbs off, and cut the trunk in pieces, just as a wood-

chopper would trim and chop up a tree. The large logs from the body and limbs are stripped of their bark, tumbled into the water, and floated to the place where the dam is to be made, or the houses are to be built. There they are sunk, and held down by stones, mud, and other logs. The bark is saved for winter food.

The stones and earth are taken from the bank or the bottom of the stream, and carried in their fore-paws, against their throats. The wood they drag with their teeth. All the work is done by night, and the earth which they move in a single night, amounts to many thousands of their little handfuls.

Some have held mistaken notions about the beaver's tail. It has been said that the creature carries mud on it, and that he uses it as a kind of trowel in plastering his house. Some have said that when the beaver has laid down his pawsful of mud, he turns round and gives it a slap with his tail to smooth it, and keep it in place. This mistake has probably arisen from a peculiar slap which he does give, when

he plunges into the water, or when he is alarmed. This motion does not seem to have any real purpose, but to be a kind of habit, which he does not forget even when he becomes tame.

The beaver cuts most of his wood in the summer, when the sap is in, and he takes care to choose trees which he can float down stream to his work. He does not use pines, or other pitchy trees. He lays up in autumn a supply for winter, by pulling piles of boughs into the water near his home, and loading them down with stones. When he is hungry he goes to his pantry, the brush-pile, helps himself to a stick, eats off the twigs, the small branches, and the bark, and then puts the bone away in some place on the dam, or lets it float down stream.

The beaver houses are built in the same way as their dams. They are usually circular, and about seven feet in diameter by three feet high, inside, and fifteen to twenty feet in diameter, and seven or eight feet high, outside. Such a house will shelter four old beavers, and six or eight young ones, giving them a warm, dry

place to eat and sleep in. The shape is like an oven, or an Esquimaux snow-house. The entrance is from the water, by a passage which opens near the middle of the floor; and the beavers' nests are arranged, each by itself, against the wall.

Some houses are still larger, and appear to have several rooms, separated by partitions; but these apartments do not communicate with each other, and are really nothing more than several distinct houses, joined together as in a block. A ditch is dug about the house, deep enough to give a passage under the ice, and opening into the deep water in the pond. This makes a way of escape if the tenants are alarmed, and prevents other animals from burrowing into their castle.

In the fall, they take great pains to repair their houses with a fresh layer of mud and stones. This they do as late as they can, even after it has begun to freeze. This covering of earth freezes very hard, and makes a secure armor against their enemy, the wolverine. In fact,

their houses are so nearly iron-clad as to stand severe battering with a pick. The hunters learn to observe the way in which these repairs are done; if the cover is made very thick, and is put on early, it is thought to foretell a long and severe winter.

The beaver is hunted chiefly for his skin. The hairs upon the skin are of two kinds. One portion is rather long, straight, and coarse, and by its overlapping, serves to shed water, like thatch on a roof. Pushing aside this outside coat, we find a beautiful fur at the bottom, whose fine, delicate fibres, are soft and wavy. This fur was formerly in great demand for making hats. Each fibre is edged with little hooks, too small to be seen unless highly magnified. They all bend one way, and when a mass of them is rubbed, these fibres become matted together, twining and locking themselves into a dense, tight fabric, in which they are held as firmly as in the skin itself. This fabric is called felt. Wool, and the fur of many small animals, have this same quality.

The long hairs are useless, and the furriers pluck them off, whether the skins are to be used as furs, or the fibres are to be taken off to make felt.

Within the last twenty-five years these animals have become very scarce, so that the fur is too costly to be made into hats, while the invention of a kind of silk plush has supplied its place more cheaply. Some idea of the great numbers which were once taken, may be had from the fact that in one year more than one hundred and twenty-five thousand skins were sent from Quebec to England.

The Indians prize the flesh very highly; especially when roasted whole in the skin after the fur has been singed off. The fur-traders do all they can to stop the waste of fur by this practice; but they can not prevent one or two feasts in each year, in an Indian village, where roasted beaver is the chief luxury. It resembles pork in flavor, but is too rank to be endured by civilized stomachs. The Indian hunters also wear pouches made of a whole beaver's or otter's

skin, which they tie about their waists. In them they keep their tobacco, powder, and whatever else they wish to secure from moisture.

The beavers are taken chiefly in the fall, when the fur is in the best order. Then, the old coat has been shed, and a new one has come out, sleek, glossy, and of good color. They are caught in traps, baited with a substance which attracts them by its peculiar odor. The young beavers are easily taken; but the old ones acquire great cunning, and tax the trapper's utmost skill. In winter, the hunters sometimes stop up all the outlets of the beaver's house, and then break in the roof with axes, and capture the entire family. Sometimes, when the frost has been very severe, large holes are cut in the ice. The creatures come to the holes for fresh air, and are killed, or caught in stout nets.

If captured, they are easily tamed. When the building season comes, the captive will industriously build a dam across one corner of the room with boots, brushes, firewood, books, and any furniture it can move. When he has piled up

all the material he can procure, he sits in the center, quite satisfied with the fine work he has made to dam up the river, and patiently waiting for the water to come and fill up his pond.

This fact sets aside all the claims that have been made that the beaver is guided by reason. He is only driven by a blind instinct, impressed upon his nature, which he must follow whether he will or not. If a young beaver which had never seen a beaver-dam or house, were set free in a suitable place, he would probably go to work in the same way, and make just as skillful plans, as if he had the example of many generations of his forefathers before him. There are, to be sure, lazy beavers, who wont work. They are driven out of beaver society, and go away by themselves and burrow holes in the banks, living as solitary and lonely outcasts.

The species described is the American beaver, *C. Canadensis.* Another species, *C. fiber*, is found in Europe and Asia, along the Euphrates, the Danube, and the Rhone. Some fossils found in Ohio indicate an animal of this family six times as large as our living species.

THE AMERICAN ELK. *Alces malchis.*

About Deer.

VERTEBRATA — MAMMALIA.

ORDER — *Ruminantia.* — Cud-chewers.

FAMILY — *Cervidæ.* — Deer-like.

GENUS — *Cervus.* — The Stag.

MANY species of deer are known, and their representatives are found in almost every climate. They are not numerous in very warm countries, but abound in temperate regions, while some species dwell where chill winter reigns during most of the year. In size, they vary from the stately elk, which is larger than the horse, to the sprightly roe-buck, which is less than the goat.

All the members of this family wear solid horns. These are formed entirely of bony matter, and are not even covered with the horny substance which forms the hoofs and horns of the ox or the sheep. In fact, though the largest and finest head-gear worn by any animals, they are not true horns, but bones. Sometimes these bony horns spread into broad palms, with sharp snags along their outer edges. Sometimes they divide into branches, of which some project over the forehead, while others rear upward in the air, or curve gracefully backward. Such a load, borne upon the head, would seem to be inconvenient, from both its size and its weight. It adds to the stately air of the creature.

All the male deer have horns, but shed them every year and renew them again. When the time comes for the horns to drop — which varies with different species, but is usually between November and March — they loosen at the base, first at the outside, and then gradually inward, until they fall. The spot on the forehead bleeds a little, but in twenty-four hours is covered with

a thin, transparent film. After a short time the skin begins to swell into a soft tumor, like a ball, full of blood, and covered with a velvety substance, having nearly the same color as the creature's hair.

This tumor grows every day at the end, like a sprout from a tree, and shoots out branches called antlers. The horn sometimes grows an inch and a half in a day; so that the whole is finished in a few days. The course of the blood vessels is marked by long, deep furrows, which always remain. While the horns, or, as the huntsmen say, the *attire*, is growing, the velvet is very tender, and the animal hides in thickets, coming out only at night, for food. When the horn has completed its growth, the blood-vessels are shut off, and the velvet coating dries up. The stag peels it off by rubbing his head against a tree, and is himself again.

Each new horn has one more snag than the horn which fell, so that the age of the animal may be readily learned. The first horn comes when the deer is a year old, and an additional

snag comes every year: if he has five prongs, he is six years old. In England, a deer is said to be of the first head and worthy of the chase, only when there are five branches upon his horns; when he is a stag of ten, he is a noble animal.

Most varieties of the deer are fleet and watchful; when hunted, they run with great speed, and choose their way with much sagacity; when hard pushed they are bold and courageous; when slain, their skins are valuable and their flesh is delicious. For all these reasons they are hunted with much zest, as well by the lordly barons of Europe, as by the tawny savages of the American wilderness. Some are easily tamed, and become quite domestic; but as a family, they fade away before the progress of cultivation. Wild deer love the margin of the forest — going out for food, and returning for shelter and concealment. All take to water readily, and swim with ease.

No variety of deer has more often been mentioned by traveler, story-teller, or poet, than the

stag, or red deer, of England, *Cervus Elaphus*. It was the favorite game in those early days, when the only pursuits thought fit for men of gentle breeding were war or the chase.

The forest laws of the old Norman kings made the punishment for killing a deer, except in the chase, as great as for killing a man. Large tracts of land were stripped of people; villages, and even churches were destroyed, to make room for herds of deer, to provide for this cruel sport.

We can imagine the stag in the quiet wood, cropping the dewy leaves, or drinking the clear stream, as the rising sun reddens the tree-tops. At early dawn the hunters mounted their steeds, and now, suddenly,

> "The deep-mouthed bloodhound's heavy bay
> Resounding up the rocky way,
> And, faint, from further distance borne,
> The echo of the hoof and horn"

startle the timid creature from his fancied security. When first driven from his cover, the stag flies with the swiftness of the wind, leaving

his pursuers far behind, until he again reaches some place which seems safe. Here he stops, looks about, and is less afraid. But the hounds follow, keeping the fresh track by their keen scent.

Again he hears them, and again he flies. He halts a second time, and runs again when the dogs come up; but his first race has exhausted him, and he can not fly as at first. He now seeks to do by artifice what he failed to do by speed. He rushes to the herd, and tries to substitute some other deer in his place, to take the track he has made. He runs back over his own course to deceive the dogs, and crosses some hard-beaten soil, where the scent will be less distinct. The easy, bounding pace which he had at first, has become stiff and heavy; his mouth is parched, his tongue hangs out, and some say

> "The big round tears
> Do course each other down his innocent nose
> In piteous chase."

His last refuge is the water. He plunges into

whatever lake or river he finds, and swims up the current, taking care not to touch any bush on the bank, lest he may leave a scent for the hounds. He even hides himself under water, exposing nothing but the tip of his nose.

Having exhausted every resource, he gathers up his remaining strength, that he may boldly face the enemies he can not escape. He defends himself with hoof and horn against dogs and men; but when the pack comes up, he is surrounded and overcome, and the winding bugle proclaims that the chase is ended.

The stag is about three and one-half feet high at the shoulder; his color is reddish brown above, and whitish beneath, with some black about the face, and a black stripe down the neck and between the shoulders. The greatest known weight of a dressed stag, is three hundred and eighteen pounds. He has a fine eye, an acute smell, and a good ear. When listening, he raises his head and erects his ears. Though a simple animal, he is curious and crafty. When called to from a distance, he stops short and

looks at horses and men, and if the men have no arms, he shows no signs of fear.

In the parks of England, the stag has generally given place to the fallow deer, *C. Dama.* This animal is much like the stag, but is smaller, feebler, and more gentle. Its color is a brownish bay, beautifully spotted. Its horns are not as round as those of the stag, and their broad extremities are spread out like palms. Its flesh is highly esteemed, as more delicate and juicy than that of either of the other kinds of deer. In strength and cunning it is far inferior to the stag; and when hunted, does not afford so long or so varied a chase.

The roe-buck, *C. Capreolus*, the smallest of the European deer, stands about two and a half feet high at the shoulders, and weighs about sixty pounds. Its color is reddish brown on the back, yellowish beneath, with a white disc about the tail. The horns are about nine inches long, round, and divided into three branches. Its motions are elegant and easy. Few sights are finer than a roe-buck, bounding among the

bushes, skipping among the hills. These deer love the shady thickets and the rising slope. They do not herd together, but live in families. The young are driven out when of the proper age, but the parents never forsake each other. The roe-buck can not be thoroughly tamed; and as it is difficult to confine it, because of the height to which it can jump, it is usually suffered to roam at large. It is very cunning, and when hunted sometimes escapes the dogs by its craft. It makes a few very long leaps, waits until the dogs have passed, and then returns on its own track.

The wapiti, or American elk, *C. Canadensis*, is very much like the English stag, and was called the stag by the early settlers, who accounted for its larger size by the greater range in the woods and prairies of the new world. It is a foot higher than the stag, and its markings and antlers are quite different. This deer once roamed over all the northern portion of the United States. The rifle and the plow have driven him away, and he is only occasionally

found in a few wild tracts of the Atlantic States, and on the prairies west of the Mississippi.

About the upper Missouri, the Indians gather the horns and pile them in great heaps, where they can be seen at a long distance. One of the mounds is said to have been twenty feet in circuit, and fifteen feet high. The horns are very large, measuring six feet from tip to tip. One might suppose that such head-gear would hinder his running through thickets and forests; but he knows how to turn them to account, by laying them upon his back, and so protecting himself from the branches through which he forces his way.

His skin is very useful. The hunters are said to have a way of dressing it, so that it does not become stiff and harsh when it has been wet and dried again. This makes it very serviceable for their hunting-dresses, which are usually made of this kind of leather.

The wapiti has less cunning than some of the weaker kinds of deer, but makes up for this want by strength and courage. If wounded, he

attacks his enemy boldly. A French writer, who had been hunting in the West, gives an interesting account of an adventure with an elk. He and his companions had crept near the herd, and had each chosen their mark:

"We drew up our rifles slowly, and both shots went off at once. The smoke hung heavily for a second or two; when it cleared away, we espied one of the elk lying down. The next instant, down rolled the other. On coming near my elk, he tried to rise, but rolled back again. I looked towards the other; when, what was my surprise at seeing a regular combat between my friend and his wounded elk, now a very dangerous enemy. Springing on her haunches, she was striking furiously with her fore-feet. One hoof missed him, but the other fell on his rifle, which he held up for safety; and, smashing both his ramrod and his loading-stick, beat him down upon his knees. Rising a second time, she was just ready to repeat her blow, when my ball caught her in the side of the head, behind the eye; and, with a splendid

bound, she fell lifeless on the broad of her back. I had made a quick, and necessarily a rather dangerous shot; but I was in luck that day. So was my friend, with a beast on one side, and a ball on the other."

The common or Virginia deer, *C. Virginianus*, has been called the fallow deer of America. It is very beautiful and graceful. It is abundant in all thinly-settled parts, throughout the Northern and Middle States. Its flesh is one of the luxuries in winter. Its skin is soft and flexible, and when dressed, is the buck-skin from which gloves and mittens are made. Its weight is about two hundred pounds. Its color is light fawn in summer, and reddish grey in winter; the under part of the throat and the tail are always white. It is very timid. When alarmed it bounds over the bushes with incredible speed; in a moment, nothing will be seen but the twinkling of its white tail — which the hunters call its flag — rising and falling, farther and farther away, till it vanishes in the distance.

This deer is often hunted by night, while feeding in the water upon the leaves of the water lily and of other aquatic plants. The hunters make beforehand a rude lantern, by peeling a circle of bark from a young tree, and making a hole in one side of this rough cylinder. A large candle of deer's tallow throws a strong beam of light through this hole. One man fixes this lantern upon his head, like a cap, and lies down in the bow of the boat, while another at the stern silently paddles the canoe along the smooth stream.

On they go, still as the night around them, till some unlucky deer is heard splashing in the water, and munching the lily-pads. At once the canoe turns towards him, and the foolish creature looks up to see the strange light that comes down upon him. It only grows brighter and brighter, swerving neither to right or left, and dazzles his eyes, accustomed to the darkness. So the deer waits, in silent amazement, until he feels the sting of a bullet, shot by the hunter in the bow.

The utmost caution and skill are necessary in this kind of hunting, for the least noise — the splash of a paddle, or even the click of a lock — is enough to break the spell which the light has thrown upon the deer, and send him bounding away into the night. If the first shot misses, he does not wait for another. Many an unlucky hunter has spoiled a night's work by paddling his canoe into the midst of a flock of ducks. With loud cries and much splashing of their wings, away they flew, scaring the deer for miles by their noisy clatter in the stillness of the night.

GENUS — *Alces.* The Elk.

The largest of the deer family is the elk, or moose — *Alces Americanus.* He is quite as large as a horse, and stands very high. His antlers are palmated, or flattened. They have measured six feet from tip to tip, the breadth of the palms being twelve inches, and the weight seventy pounds. To carry this heavy burden, he has a short, thick neck, which spoils, in a measure, the elegant proportions so much admired in other

deer; and he attracts attention more on account of his size than for any beauty or grace. His head is about two feet long, narrow and clumsy; his eye is small and sunken; his long ears are tufted with hair; his neck has a heavy mane; and his throat is covered with long, coarse hair. His body is round, short, and compact; his legs, though long, are remarkably clean and firm. His general color is grayish brown. In summer, his hair is short and glossy; in winter, it becomes long and coarse, while more warmth is secured by an under-garment of short, fine wool.

Moose are seldom seen farther south than the northern parts of New England and New York. In summer, they live near the streams and lakes, where they feed upon the water-plants, or browse on the bushes which grow along the banks. In winter, they go to the dry mountain ridges, and make a haunt, or "yard," on a slope facing the south. They find some place where there are plenty of maples, or other hard wood trees, and feed upon the twigs or the

tender bark. They pull down, with their long upper lips, the branches which they can reach, and hold them between their fore legs until the twigs are eaten off.

The season for hunting this animal, is in March or September. It is useless to follow him when the snow is fresh and soft, for, with his long legs and great strength, he can wade easily. When the warm sun in spring melts the surface of the snow, which the cool nights freeze again into a thin crust, the sharp snow-ice breaks his legs, or at least so disables them that he can not run.

The Indians take him with snares. When they find the path which he is accustomed to follow, they bend a stout sapling over the track, and so fasten it that a slight pull will set it free. A strong noose is fastened to this trap, and if the head or horns of a moose is caught, he is lifted into the air and killed.

The movements of this creature are clumsy. The hind-legs are shorter than the fore-legs, and he shuffles along, spreading his hind feet to

avoid treading on his fore-heel. He does not gallop or leap, but trots along; and when he comes to a fallen tree, or a fence, steps over it. When he runs, he holds his nose high, that he may lay his horns upon his back. This prevents his seeing well, and causes him to trip occasionally, and get a heavy fall. He is said to combine the strength of the ox with the speed of the horse, and to be easily domesticated. A gentleman in Maine trained a pair to draw a carriage. They did the work very well, but if they took it into their heads to go into a lake or river, to cool themselves, nobody could stop them.

GENUS — *Tarandus.* The Reindeer.

A remarkable member of the deer family, found in both the old and the new world, is the reindeer — *Tarandus rangifer;* called *reen* by the Laplanders, *caribou* in Canada, and *bennesoak* by the Esquimaux. It lives, where no other ruminating animal could live, on the white mosses which cover the ground like snow in the low-

lands, or on the long black lichens which trail in the forests.

It is about four and a half feet high. Its horns are long, slender and round, with antlers flattened at the ends. Its thick, warm coat is brown above and white beneath; as it grows old, it turns gray, and sometimes quite white. Its long black hoofs are cloven, and the parts spread when they are set down in the snow, giving a broader footing. When lifted, they strike each other, and make a clicking noise, which may be heard at some distance.

The reindeer is the Laplander's only wealth, and his sole means of living. When harnessed to a sledge, it draws him and his scanty household goods from one place to another, instead of a horse. Like the cow, it gives him milk, cheese and meat. Like the sheep, it furnishes warm though homely clothing, as well as tents and bedding. The tendons, he uses for thread; the horns are made into various things of use; the tongues are a delicacy which he exports.

Sometimes a single herd contains as many as a thousand deer, but usually not more than two or three hundred. With such a fortune, the Laplander is independent. With two hundred deer, and a small family, he can get on; but if he has but one hundred, he is a poor man, and usually joins his stock to that of some wealthy neighbor, for whom he works as a herdsman.

Von Buch, a celebrated traveler, thus describes the milking time:

"It is a new and a pleasing spectacle, to see, in the evening, the herd assembled around the gamme (encampment) to be milked. On all the hills around, every thing is in an instant full of life and motion. The busy dogs are every where barking, and bringing the mass nearer and nearer; and the reindeer bound and run, stand still and bound again, in an indescribable variety of movements. When the feeding animal, frightened by the dogs, raises his head, and displays aloft his large and proud antlers, what a majestic sight! And when he courses over the ground, how fleet and light are his speed and

carriage! We hear nothing but the incessant cracking of the hoofs, as if produced by a succession of electric shocks — a singular noise; and from the number of reindeer by which it is produced, it is heard at a great distance. When all the herd, consisting of three or four hundred, reach the gamme, they stand still, or repose themselves, or frisk about, playing with their antlers against each other, or in groups surround a patch of moss, browsing.

"When the maidens run about with their milk-vessels, from deer to deer, the brother or servant throws a bark halter round the antlers of the animal which they point out to him, and draws it towards them. The deer generally struggles, and is unwilling to follow the halter; and the maiden laughs, and enjoys the labor it occasions, and sometimes wantonly allows it to get loose, that it may again be caught for her; while the father and mother are heard scolding them for their frolicksome behavior, which has often the effect of scaring the whole flock."

In reviewing the natural history of the deer,

we are forced to admire the wondrous forecast with which that Providence which feeds the ravens and clothes the lilies, has created them for a specific purpose, and has given them qualities which peculiarly fit them to fulfil this purpose. Like most other animals which chew the cud, they were doubtless meant to be food for man; but, unlike the ox or the sheep, they vanish before cultivation, and are food only for savage man. But the savage would kill them without discretion, and wild beasts are equally fond of them. Danger threatens every where. Hence they have an acute sense of smell, a very delicate ear, with great speed and activity; while their natural timidity keeps them always alert. It is not easy to approach a deer from the windward, and the slightest noise puts the whole herd to flight. Thus, by constant watchfulness, the race is preserved, in spite of attacks by savages or wild beasts, and only retires before the superior skill of civilized man, armed with weapons more deadly than the arrow and the javelin. Doth God care only for deer, and ravens, and lilies?

THE VAMPIRE BAT. *Vampyrus spectrum.*

About Bats.

VERTEBRATA. MAMMALIA.

ORDER — *Cheiroptera.* — Hand-winged.

GENUS — *Pteropus.* — Wing-footed.

"Bat, bat, come into my hat,
And I'll give you a leg of bacon."

SO cry the boys, throwing high their caps, when one of these little creatures goes flittering through the air, in the twilight of a summer's evening. Here and there they are, sweeping round the light, away into the darkness, seen but a moment, and then gone, as quick and as still as thought. Did any bat ever accept the challenge, and come for the bacon? Perhaps they are too intent in chasing

the small game which they follow in their flickering flight, to heed such grander offers. At any rate, they eat a vast number of insects.

One summer evening, a bat was caught in the room where the writer was sitting. We put him under a glass case on the table, and then brought him all the moths we could find. When he saw a moth, he would crawl towards it in his uncouth way, until he was near enough to spring, and, in a flash, he had it in his mouth. But the moth was too large to be swallowed at a gulp, and lay across his jaws. He could not turn it round; he could not swallow it as it was; and he was too shrewd to let it go, and trust to catching it again. Moreover, the light was brighter than any he was used to, and a number of strange eyes were watching him. Although afraid, he seemed to think best to secure his prize first, and then consider his situation.

He had no fingers or paws on his fore feet, which could help him with his moth, but he brought his hind feet to his face, curling himself nearly double, turned the moth round in a

twinkling, so that he could begin at the head, and then munched it down — body, wings, and all — very much as a cow eats a wisp of hay, or a cabbage-stalk. This amused us so much that we ransacked the house, and kept him busy all the evening.

We left a narrow — very narrow — place for the fresh air to come to him, that he might not suffocate during the night; and in the morning he was gone. Whether the cat made her supper of him, or some person lifted the case and let him go, or he raised it and freed himself, we did not know. We thought he had no great cause of complaint against us. We had given him a fat supper for a short captivity; and he had paid us for our pains, by showing us how curiously he trussed his fowls and ate them.

Like the toad, the bat has been much abused. People used to think that the acrid juice that the toad covers his skin with, when he is handled, is poisonous; and that he has a poisonous stone in his head. Neither of these things are true; and the bunch-backed toad, that silly

children are sometimes afraid of, is one of the most useful servants in the garden. Just after nightfall, when you see him hopping about, a little more busy than usual, though never in a hurry, unless to get away from your stick, he is only looking about for his supper. He jumps under a cabbage-leaf, and his bright eye sees a worm fastened to the under surface, where you would never think of looking. His little red tongue darts out like a flash, so quick that you can scarcely see it, even if looking right at him; he smacks his jaws once, and the worm is gone, while he hops on after another.

So the bats have been thought to forebode disaster, and their silent flight through the house has been deemed an evil omen. There is nothing of the kind. They really do a great deal of service in their way, catching insects which fill the air. In fact, they do by night very much the same work which the swallows do by day, and in very much the same way.

The name *cheiroptera* signifies *hand-winged*, and has been given to this order, on account of the

curious way in which the fore-paws, or hands, have been developed into wings. If the fingers of a man were drawn out like wires, or umbrella bows, three or four feet long, and then a thin membrane should stretch from finger to finger, and from the little finger along the sides and legs to the feet, the man would make a pretty good imitation of a bat. This membrane, which covers the framework, and so makes the creature's wings, is very thin, soft, and delicate, and nas no hair or fur. It is plentifully supplied with nerves, and is so sensitive that it seems like a second pair of eyes. One naturalist, more scientific than humane, put out the eyes of several bats, and then let them loose in a room where he had stretched strings in various directions. They flew back and forth, through the network of strings, without touching them, as if they had another sense similar to sight.

In order to furnish muscular power to move so large sails as the bat spreads, his breast-bone is made to project forward in a strong ridge, like that of a bird. The shoulder-blades and collar-

bones are also very strong; and in the whole structure of that part of the body, he resembles the birds. The long fingers serve to fold the wings together, when not in use. The thumb joint is not attached to the others. It has a hook at the end of it, by which the bat drags itself along when on the ground; he also has hooks on the hind feet, to hang himself up with when he sleeps.

The bats include five sub-families, nearly eighty genera, and a great number of species. They may all be placed in two great groups: the *frugivorous*, or fruit-eating; and the *insectivorous*, or insect-eating, bats. The first are also called *rousettes*.

These have sharp, cutting teeth, and flat grinders. They sometimes vary their fruit diet by eating birds and small quadrupeds. They live in East India and Africa. Of the forty known species, the black *rousette*, *Pteropus edulis*, or eatable bat, is the largest. It has a body as large as a cat, and its wings spread about four feet. It lives in Sunda and the Molucca Islands.

The kalong, or fox-bat, *P. Javanicus*, a native of Java, spreads its wings about five feet. These bats live in companies; and having chosen a large tree for their home, hang by the claws of their hind feet to the naked branches. A stranger might mistake them for some kind of fruit, or game, hung up in a market for sale. So they sleep through the day, enveloped in their leathery wings; but at night they quit hanging, and start out in quest of food. They direct their flight to the forests, villages, and plantations, and do immense injury by eating up every kind of fruit, from the commonest and coarsest, like the cocoa-nut and bread-fruit, to the rarest and most delicate. The natives have to cover their mangoes with wicker baskets, to preserve them from the havoc of these plunderers. Imagine the mischief, if your neighbor's cat, and all the rabbits and woodchucks of the forest, could fly into your pantry and store-room, and eat all the provision which had been carefully hung up, out of the way!

But, as we said in the beginning, most of the bats, including all among us, live upon insects.

GENUS — *Phyllostomæ*. — Leaf-faced.

The genus *phyllostomæ*, the vampires, has a curious membrane, like a leaf, which grows on the end of the nose. They live in South America. They have a bad reputation of sucking blood from animals, and even from men. The ends of the toes of men, the ears of horses, or the combs and wattles of fowls, are said to be its favorite pastures. When it has found a feeding-place, it watches until the creature it proposes to bleed is fast asleep. Then it carefully fans its victim, while it bites a tiny hole, not larger than a pin's head, through which it draws blood enough for a meal.

Darwin relates that in Chili, near Coquimbo, the servant found his horses very restive; putting his hand, in the dark, suddenly upon the withers of one of them, he caught a vampire. In the morning, the place where the bite had been made, was readily found. Waterton says

that he has repeatedly seen both men and animals which had been bled by vampires, and had examined their wounds. But he also says that he never could discover how they actually drew the blood.

"For the space of eleven months," he writes, "I slept alone in the loft of a wood-cutter's abandoned house, in the forest; and though the vampire came in and out every night, and I had the finest opportunity of seeing him, as the moon shone through apertures where windows once had been, I could never be certain that I saw him make a positive attempt to quench his thirst from my veins, though he often hovered over the hammock."

Others explain such facts, by saying that there are some persons whom a vampire will not touch, while some frequently suffer.

This bat, *P. spectrum*, has a body about six inches long, of a reddish-brown color.

GENUS — *Vespertilio*. — That fly at evening.

The common bats belong to the genus *vespertilio*, named from their habit of flying at evening or vesper. The English and German boys call them flitter-mice. Some half-dozen bats of North America are referred to this species.

The red bat, *V. noveboracencis*, is three to four inches long, and spreads his wings from ten to twelve inches. Its color is reddish-tawny. The hoary bat, *V. pruinosus*, is four and a half inches long, and spreads fifteen. He is gray above, with a fawn-colored band about the throat. The little brown bat, *V. subululatus*, is three inches long, spreads nine inches; color, olive-brown above, brown beneath.

GENUS — *Plecotus*. — Folded-ear.

The genus *plecotus* is distinguished by a fold, or pointed membrane, in the ear, whence its name, folded-ear. When hanging by the hooks of its hind feet, the real ears, which are almost transparent, and are very beautiful, are tucked under the wings, and the fold seems to be the

ear — quite changing the whole appearance of the creature. Mr. J. G. Wood says:

"This bat, *P. auritus*, is very easily tamed, and will take flies and other insects from the hand. One that I had in my possession, used to hang by the wing-hooks during the whole of the day, and could hardly be persuaded to move, or even to eat; but when the evening came on, it became very brisk indeed, and after carefully combing itself with its hind feet, it would eagerly seize a fly or beetle, and devour it, always rejecting the head, legs and wings. It was then very impatient to be released from the cage, and would show its uneasiness by climbing about the cage and fluttering its wings. During the short time that it lived, it seemed very gentle, and only bit me once, though I used frequently to handle it."

Poets and painters have adopted, if they have not increased, the popular feeling against bats. The ancient idea of the harpies, half bird and half human, which flew to tables spread with food, and defiled what they did not devour, may have been borrowed from the larger creatures

of this kind, which dwelt in Eastern countries, The Scriptures speak of them as unclean, as emblems of darkness, desolation and ruin. Sculptors have used them to signify night and sleep. As painters have given to angels the wings of doves, so they have clothed their demons with the plumeless, angular, yet powerful, wings of bats; and an artist need only paint a gloomy, rocky cave mouth, with the outline of a bat's wing in the thickening shade, to suggest a horrible den, peopled with fallen spirits.

THE CRESTED SEAL. *Phoca cristata.*

About Seals.

VERTEBRATA. MAMMALIA.

ORDER — *Carnivora*. — Flesh-eaters.

FAMILY — *Phocidæ*. — Seal-like.

GENUS — *Phoca*. — The Seal.

DO you know that fishes breathe? They do breathe, but not just as men, birds, or beasts, that live in the air, breathe. You know that you have lungs, into which you draw air through your nostrils. In your lungs, there are millions of little cells, or bags, with very thin, delicate linings. The blood from the heart comes to one side of this lining, and the air to the other side. A part of the

pure air which you have breathed in, goes through into the blood, and is carried away with it, all over the body; while impure air from the blood comes through the lining, and is breathed out.

Your lungs are in your chest, but a fish's lungs are in the side of his face, and are called gills. You can easily lift the gill-covers, and find them. The gills are thin plates, edged with very many little cells, which the blood circulates through. The fish takes water in at his mouth, and forces it out between these plates, over the thin lining of the cells. The water has some air mingled with it, which passes through the cell-linings, and purifies the blood, so that these cells act very much like the cells in your lungs.

If you hold the mouth of a fish open, so that he can not force the current of water through his gills, he will suffocate and die — just as a man will die, if you should stop the air from going to his lungs. If the fish is taken out of the water, or the man is placed under water, each will perish, because his lungs are not fitted

to purify the blood, while they are acting in such a medium. The gentle opening and shutting of the mouth of a fish, which you see in a vase of gold-fish, or in an aquarium, is to the breathing of the fish, what the gentle and constant heaving of your chest is to your breathing.

You can easily understand now, that creatures which live in the water are not fish, unless they are fitted to breathe under water. The whales, which are often called the largest fish in the sea, are not fish at all. They have a fish-like form, because that form is best fitted for motion through the water; and their fin-like paddles are just so much of arms or legs as they need to push themselves along. But the whale breathes with lungs instead of gills, and if forced to stay under water, even for a couple of hours, would drown like a man or a horse. Besides their manner of breathing, the young of whales are born and fed during infancy, like the young of other mammalia.

The family of seals, likewise, live mostly in the water; and their forms, gradually tapering

from the shoulder to the tail, fit them for motion in this element. Their fore-legs are very short, being little more than paws, or paddles, fastened at a sort of shoulder. The hinder legs are turned backwards, so as to seem almost part of the tail; the thigh and leg are very short, and the foot is formed like the fore-paw — the toes webbed. Their bodies are covered with a thick double fur, which, in water, is pressed close to the skin, and keeps out the wet. This fur is kept constantly oiled by fat secreted from the skin, and is thus made water-proof. Besides the thick garment of fur, the seal wears, just under his skin, a warm under-jacket of fat, which helps to keep out the cold, even in the icy regions about the pole.

The motions of the seals in water are very easy and graceful. They are driven mostly by their hind feet, which turn inwards, and obtain much force against the water. When they would come on land, a few sharp strokes shoot them out upon the shore, or the edge of the ice, and then they scramble up as fast as their short

legs will carry them. On land, they move very awkwardly, in a gait between a crawl and a shuffle, but considerably fast. When they take to the water, they wriggle to the edge, and tumble themselves in without ceremony, glad to be at home again.

They are expert fishers, and so get their living. Tame seals have been trained to catch fish for their owners. They become quite docile, when carefully taught. Their eyes are large, full, and intelligent. Their nostrils and ears are so formed that they can be closed when under water. Their teeth are armed with long, sharp points; fish once caught seldom escape.

The common seal, *Ph. vitulina*, inhabits the colder waters of most parts of the world. It is a handsome creature, with beautifully mottled skin, and large, intelligent eyes. Its color is generally grayish yellow, with spots of brown or black, which are largest on the back. Its length is seldom more than five feet.

The fishermen dislike the seal very much, because it has more skill than they. It will

even take the fish out of the fishers' nets. A crafty old seal will keep up this kind of robbery for years, without giving the fishermen any opportunity for revenge.

The Irish have a strange tradition about a seal, which haunts the same waters for a long time. They think the creature has a charmed life; that no bullet, however well aimed, will strike him; that no steel, however keen or well thrust, will pierce him; that no array of nets will hold him. So, if the seal be only bold and wary, he soon gets a reputation which is a sure protection; for no one will dare to attack a creature which is under supernatural protection. Indeed, the fishermen generally think it unlucky to kill a seal, and that the murderer will have no farther success at sea; so they suffer the robbery as calmly as they can.

The capture of seals becomes a profitable business in many parts of the world, particularly in Newfoundland, and in the islands about Cape Horn. They are valuable for their skins, and for the oil which is obtained from their fat.

Those who catch seals, land as quietly as possible, on the shore, or the ice where the animals are lying, and cut off their retreat to the water. As the frightened seals try to escape, the sealers strike them over the nose with clubs, and stupefy them. A wounded seal will fight savagely. It turns upon its side, shuffles along, and scratches furiously with its fore-paws. If a man is in its way, it tries to throw itself upon him, and bear him to the ground. When the beach is covered with coarse gravel or pebbles, it is quite as safe to be before the seal as behind him; for in his rush to the water, he throws a constant stream of stones behind him, which it is not easy to avoid. In the water, the seal may some times be shot with a rifle; but the hunter must be very skillful, for the animal shows only a small portion of his head, and, if not killed at once, will escape into deep water.

The common seal is easily tamed, and makes one of the kindest pets, displaying a beautifully loving and gentle nature.

An English author gives an account of a seal

which was taken when probably about a fortnight old. In a few weeks, it became quite tame, would eat from the hand, follow its keeper about, and show by its action that it knew and loved him. It was fond of warmth, and would lie for hours by the kitchen fire, raising its head to see a new comer, and nestling close to the dogs, who soon became quite reconciled to their new friend. The winter after it was caught was rough and stormy; boats could not often go to sea, and there was but little fish for the seal to eat. Milk was used instead; but it consumed a great deal, and the keepers finally concluded to return it to the sea, and let it take care of itself.

So it was taken out about two miles from shore, in a boat, and dropped quietly overboard. But it was not willing to be turned away. Fast as the boat was rowed, the seal swam still faster, crying all the time so loud that it could be heard a great distance, and so pitifully that its owner could not help taking it in, and carrying it home again, where it lived in clover for a long time.

Another author mentions a tame seal, which was repeatedly put overboard at sea, but as regularly returned to the house which it loved. Once it contrived to creep through an open window, and so reach its old corner by the fire.

The harp seal, *Ph. grœnlandica*, is named from the peculiar marking of its fur. When but a few months old, it is nearly white, and is clothed with wool; during the second year, it turns gray; in the third year, it is marked with dark spots; and by the fifth year, it has two broad dark bands, extending from the shoulders to near the tail. The figure formed by these bands is thought to resemble the form of an ancient harp; whence the name. The native Greenlanders have several names for it, according to its age and markings. In the first year, they call it *atak;* when full grown, *attarsoak.*

This seal lives in great numbers on the coasts of Greenland, Iceland, and other Arctic regions. It does not come on shore, but prefers to lie on the floating islands of ice, where it gathers in large herds, under the rule of a single chief.

One of the herd is always made to do duty as a sentinel, and is expected to give warning when danger approaches; but, for all that, a skillful hunter finds little trouble in coming near enough to destroy them.

The harp seal is hunted for its fur. Its oil is thought to be the purest and best of animal oils. Like the common seal, this species is very intelligent, and is easily tamed.

Another species is the crested seal, *Ph. cristatus*. This creature has a broad head and a short muzzle. From the muzzle a keel-shaped crest rises six or seven inches, and seems to support a sack, which, like a hood or cowl, covers the whole head, and is only a strange enlargement of the nose. We have before said that the seal, when taken, is usually stunned by a sharp blow over the nose. The crested seal finds this hood a great protection, deadening the force of the club. An animal which the hunters supposed to be killed, often recovers, and fights desperately with teeth and claws.

This seal is of great value to the Greenlander

Of the skin, he makes his thick, warm clothing, from his bonnet to his boots; and, besides, he covers his water-proof *kayak*, or boat, with it.

This boat is small, sharp at each end, and entirely covered over, except a small hole in its deck, just the size of the owner's waist. He tucks himself through this hole into the boat, and then braves, single-handed, the fury of the ocean waves. He uses the teeth of the seal for spear-heads, and makes floats of the creature's stomach. These he fastens to the spear, to show where it is, and to resist the struggles of an animal wounded in the water; and thus he gets a chance for another blow.

He has two ways of catching *neitsersoak*, as he calls this seal. The animal makes for itself holes, through which it can crawl upon the ice without going to the edge of the field. When the hunter finds a seal-hole, he builds a wall of snow and ice near by, and hides until the game comes out. At another time, he creeps towards a seal which he sees lying on the ice. If the animal moves, the

man drops, and lies still until the seal recovers from its fear, and goes to rest again. Then the man must lay aside all human ways and motions, and imitate only the actions of a seal. In this way, he slowly creeps between the creature and its hole, or comes up to it when asleep, and kills it.

The elephant seal, or sea elephant, *Ph. leonina*, is the largest member of this family, measuring sometimes thirty feet in length, and eighteen feet in circumference. It gets its name, not only for its great size, but for a curious extension of the nose, something like the trunk of an elephant. Only the males have this proboscis, and they do not show it unless excited. Then they thrust out the nose, blow through it, and look fierce. In spite of all this bluster, they are not disposed to fight, except occasionally with each other, and will run away from danger if they can.

A single large male will furnish about seventy gallons of very pure oil. The fur is bluish-gray, shading to brown. It is common in the south-

ern hemisphere, and migrates to colder latitudes and back, as the seasons change.

Another seal found in the southern ocean, is called the sea-leopard, from its spotted skin.

The sea lion, *Ph. jubata*, is about fifteen feet long, and weighs about sixteen hundred pounds. It frequents Kamtschatka, and the western coast of North America. It is by nature quiet, and will suffer pretty rough usage before it will move from the spot where it happens to lie.

As the sea lion is so called from the coarse hair about its neck and shoulders, like a mane, so the general appearance of the next species we shall mention, gives it the name of sea bear, *Ph. ursina*. This seal is only about eight feet long. Its limbs are better developed than those of any of its cousins, and it can stand, walk, and run, quite well. Its fur is grayish-brown, very soft and wavy, and brings a high price.

When these seals come on shore in the beginning of summer, they are found in families, each old male having sometimes forty or fifty wives. Each family takes for itself a part of the beach,

where no intruders are allowed to enter. If a trespasser is found, a general fight begins, in which all ages and sexes join in great fury. One traveler, who was not suitably armed, was glad to get upon a rock, which the seals could not climb; there he was kept a prisoner for several hours. The father of the family is very strict in his discipline, and treats his wives quite harshly; if a mother should drop her cub, when carrying it away, the old fellow at once turns upon the culprit, and punishes her fault with a bite.

These animals seem very intelligent, and have a great variety of tones, by which they converse with each other, and even express their meaning so distinctly that men understand them.

The most strange and fearful of the seal family, though not the largest, is called the walrus, morse, or sea-horse, *Trichecus rosmarus*. The feature peculiar to this animal is a pair of long tusks, of the finest ivory, which project downward from the upper jaw. These are sometimes two feet in length, and weigh upwards of

ten pounds each. The ivory is so fine and hard that dentists formerly held it in great demand for making artificial teeth. In fight, these huge tusks become dangerous weapons, piercing through the planks of a boat, and even driving away the polar bear.

The walrus is sometimes twenty feet long, and as large round as a large ox. It is covered with short brown hair. It feeds upon sea-weed, shell-fish, fish, and small seals.

The large herds in which the walrus gather, present a curious sight. When a walrus comes out of the water, it lies down on the shore, and does not care to stir. But the next one comes up, and wants a place. As it is not convenient to climb over the first one, he butts him along, forcing him to make room, and both lie down. Then comes another, and they all move again. The huge creatures are ever in motion, butting and tumbling each other, and keeping up a constant roaring, which sometimes tells the sailor, when shut in by a fog, that ice is near.

These herds number several thousand. When

disturbed, all go scrambling to the water, making it any thing but safe to be in their way. Those who hunt them, take dogs, which frighten them farther inland, and scatter them. The movements of the creature on land are very clumsy, as one might guess; yet it contrives to get over the ground tolerably fast, by a series of jerks and leaps, sometimes helping itself along by its tusks.

The Esquimaux make great use of walrus meat for food, and Dr. Kane speaks of frozen walrus as a great luxury to a benighted Arctic voyager — crackling in the teeth with a rich nutty flavor.

THE AMERICAN BISON. *Bos Americanus,*

About Cattle.

VERTEBRATA. MAMMALIA.

ORDER — *Ruminantia.* — Cud-chewers.

FAMILY — *Cavicornia.* — Hollow-horned.

GENUS — *Bos.* — The ox.

HAVE you ever stood in the yard of some large farmer, on a quiet October evening, when the great red sun was calmly sinking through the haze of the Indian summer, and watched the long train which came in from the fields?

The toil of summer is over. The grain is all harvested; the fruit is garnered; the potatoes are in the bin; and all day long the tramp of horses and the whirr of the threshing-

machine has resounded from the stock-yard, or the merry laugh has echoed from the group gathered round the corn-rick, stripping the husks from the golden ears.

The cattle in the meadows have been nipping the short thick grass which has grown since the hay was cut, and now come home for the night. Here are the oxen, looking gravely out from under their wide-branching horns, and stepping heavily and slowly over the rails which have been let down to give them passage. There the cows, meekly, and of their own accord, turn down the well-known lane to their yard, and wait the quick and skillful hand of the milker.

Down in one corner, the sheep — poor silly things — have huddled themselves together, fearing to stay, yet dreading to leap, till one, made desperate by impending fate, jumps the only bar, and at once the air is full of twinkling tails, as the flock go scrambling after. Tommy has thrown the halter round the gray mare's nose, and jogs along after it, upon her back. Dick is dashing about on the sorrel colt, to the

great annoyance of the calves, and — if it could be broken — to the imminent peril of his own neck. Great, black, shaggy Bruce puts up his nose, and barks his hoarse, gruff greeting. The great gate swings behind the last that goes in. The sheep gather round their racks; the cows stand to be milked, or lie down to chew the cud; the horses are fed in their stalls. The twilight shadows deepen into night, as the careful husbandman makes all secure, and turns his weary feet toward his cheerful fireside.

"The curfew tolls the knell of parting day;
The lowing herd winds slowly o'er the lea;
The plowman homeward plods his weary way,
And leaves the world to darkness and to me."

Of the domestic animals, none is more thoroughly and entirely useful than the ox. The hog is a filthy creature, a nuisance when alive, and little better when killed. The sheep may wear a more serviceable garment; the dog may be more sagacious; the horse, more swift; but the ox surpasses them all. He is strong, patient,

and docile to labor. The cow repays all the care and food she requires, with her milk and cheese and butter. When no longer useful, alive, his value is none the less after he is dead. His flesh furnishes the most serviceable and substantial food. His hide is converted into innumerable varieties of leather, from the great belts which turn huge machines, to the delicate material of a glove. His hair binds the particles of mortar together, in the plaster of our rooms. Of his horns, combs, buttons and knife-handles are made. Even the parings of skin, the hoofs, and waste bits, are boiled into the thick paste which we call glue. His nature adapts itself to every place and to every climate, although he thrives best in those regions where the soil and climate are best fitted for the life of man.

The species of the genus *bos*, whose numerous varieties are all called oxen, is not known as a wild animal. Like the horse, if he ever had any untamed relatives, they have long since vanished. Mention is sometimes made of wild cattle in the north of Scotland, and on the plains

in south-western Russia; but there is little reason to believe that they are the relics of the native wild stock. Like the immense herds now found in South America, they are probably the descendants of tame cattle which have gone astray, and become wild. The wild Scotch cattle are only found in a few parks, and have never been seen free in the unenclosed wild places of the country. These cattle are pure white, with black horns and hoofs.

The domestic cattle of the Highlands were usually dark, varying from dun to black, and so were called "black cattle," in distinction from those which were wild. The term is now used in England, to distinguish the oxen and cows from the other animals of the farm-yard, which are called "small cattle."

Columbus brought cows to Hispaniola in 1493. The Spaniards soon sent more to their various colonies, and from them the vast herds of Texas and South America have descended. The French brought cattle to Canada in 1600; the English, to Jamestown in 1611,

and to Massachusetts in 1624. The early settlers had few and poor barns; sometimes their crops of hay failed, or were destroyed by the Indians; and their herds, poorly sheltered and badly fed, suffered very much from the severe climate. The breed grew small and rough, and was good neither for the dairy or for the butcher. Afterwards, more care was taken, the native stock was improved, and new importations of fine cattle were made from England.

Although all the English cattle probably descended from the same source, they have come to differ very much among themselves, and are called by different names. The varieties have been classed by the size of their horns. The short-horn or Durham stock are large, thick and solid. They give rich milk sparingly, and are unrivalled for beef; but are too heavy and slow for work. The long-horns, including the cattle of Lancashire and Leicestershire, do not find much favor in this country. The middle horns are not a mixture of the other two kinds, but are a distinct variety. The most

noted of these are the Devons and Herefords. They have long, straight bodies, and clean, fine limbs, are quick and docile, and so are well adapted for work. They fatten easily, and their various good qualities make it difficult to decide between them and the Durhams. Besides these, the Ayrshires and Alderneys find favor, either for the ease with which they are kept, or for their beauty, or some supposed fitness for peculiar localities.

No animals are more free from disease, than cattle, if properly treated. In summer, they need good pasture; and in winter, good hay and roots, with clean, airy stables, and plenty of water and exercise. They furnish the means of keeping the land fertile, and generally a district where dairies are kept grows richer every year, while lands constantly used in raising grain, grow poorer.

One variety of this same species is the Brahmin bull, or zebu of India. The bulls are deemed sacred, and wander where they please without being disturbed. If one lies down in

the narrow street, and blocks up the way, the passers take some other route, and leave him at rest. It is thought a sin to kill them, and as they are allowed to help themselves to whatever they like, even out of the baskets of the market women, they get very fat and lazy. They are of all sizes, from that of the common ox, to the littleness of the Shetland pony. Some are entirely milk-white, but most are dun, passing into black above and white beneath. Their horns have considerable variety of size and curvature; their large ears hang down beside their cheeks; the dew-lap is very large. The flesh is not so good as the beef of common cattle, except the hump, which all think delicious when properly cooked. This hump is a large mass of fat above the shoulder, and is peculiar to the creature.

The other members of the ox family are the bisons and the buffaloes.

The bisons are distinguished from the oxen by the form of the head. The forehead of the ox is flat, the space between the eyes is narrow,

and the horns are set upon the side or edge of the face. The forehead of the bison is rounded, and the eyes are farther apart, and on the sides. The horns grow from the frontal bones of the skull, and are arranged so that the animal can push with his great weight, and keep his neck and horns nearly in a straight line. When the ox tries to push with one horn, he must bend or twist his neck, so that he is in danger of breaking it, if he springs with all his force; or, if the neck is straight, the horn may break.

The bison has long, clean legs, and a compact body. He is better fitted to run than any others of the family. He is strong and bold. His very look is fierce, and he is as savage as he looks. This nature, and the peculiar build of his head-gear, make him an ugly customer at a rush. The chase is dangerous, but the excitement keeps pace with the danger, and so the bison is eagerly hunted. Besides, the skins are quite valuable.

GENUS—*Bison*. The Bison.

The American bison, *B. Americanus*, commonly called the buffalo, once roamed over nearly all North America, but is now found only on the great plains between the Mississippi and the Rocky Mountains. He is the largest beast of America, and is characterized by a large head, which he carries low, a broad forehead, broad full chest, large hump between the shoulders, thin loins, and rather slender legs. The horns are thick at the base, and taper quickly to a point. In summer his coat is thin, but in winter he wears a thick coat of hair, with a filling about the roots very much like wool The hair upon the head, neck, shoulders, and fore-legs to the knees, is long and shaggy. His color is brownish black.

These animals gather in herds, often including very many thousands. The paths leading to their different pastures and watering-places, are well-trodden roads. When feeding, the herds are frequently scattered over a wide space; when they move forward in one mass,

they form a dense column, which is not easily turned. Even if the leaders are checked, they can not retreat or stop, for the crowd behind drives them forward.

The Indians take advantage of this. They choose some, who disguise themselves with the heads and horns of buffaloes, and lead the herd near the brink of a precipice. When the proper time comes, these decoys hide in some crevice of the rock, which they have looked out beforehand; and others, with great shouts and clashing of weapons, frighten the animals to certain destruction.

At other times, the Indians and white rangers hunt them on horseback. The hunters ride to the herd, select their game, and give chase. The cows, which are chosen for the best beef, are very fleet, and give a horse a long race; but every nerve of steed and rider is strained to the utmost. The trained horse swerves as he comes up to the bison, and a bullet or an arrow, thrown in behind the shoulder, usually brings down the game. If the animal does not fall, it is wise for

the hunter to get quickly out of the way; if it does fall, it is left, and another is pursued. Thus the chase goes on, until the hunter is weary, or the day is gone; then the dead bisons are found, and their skins, with the tongues, and so much of the meat as is wanted, are taken away.

When the bisons are on their guard, it is difficult to come within reach of them on horseback. At such times, the hunter dismounts at a safe distance, and fastens his horse. He then creeps on the ground towards the herd, pushing his gun before him. If the bisons look up, he remains perfectly still, so that they may suppose him to be a stump or a rock. When they see no movement, they go to eating, and he to creeping again. In this way, if skillful, he may get near enough to kill two or three.

The skin of the bison, tanned in the Indian manner, with the hair on, is the well-known buffalo-robe, so comfortable a protection against winter's cold, so cosy a covering in a sleighing frolic. The horns are wrought into powder flasks; the wool has been made into hats, and

even into coarse cloth. The Indians of the prairie depend on these animals for almost their entire subsistence — food, tents, clothing, and utensils. The flesh is their chief food, eaten fresh in summer and dried in winter. The skins furnish tent covers, blankets and bedding; of the coarser parts, they make saddles, and long ropes, or lariats, to fasten their horses or tie up their bundles; and, besides, they furnish the chief article of trade with the white men, and the only means by which they can procure guns, knives, beads, and such other things as they wish to buy. The sinews, they use as bow-strings; and the small fibres as twine or thread. The brains serve to soften and dress the skins. The hoofs are mallets, and the leg-bones are sharpened into chisels. Other bones are pointed and made into needles or awls. The ribs are curiously twined together with sinews, to make bows. One traveler relates that the first of these bows so pleased him for the ingenious skill with which it was made, that he offered his horse in exchange for it; his offer was refused. The

improvident slaughter which the Indians make of this beast, so invaluable to them, is very wasteful. Myriads are slain every year, merely for their skins, their humps, or their marrow-bones — the rest being left to the wolves and the vultures.

The European bison, *B. bonasus*, differs from the American in being smaller, less shaggy, and in having coarser and shorter wool. He is savage and fierce. He is found only in the marshy parts of Poland, in south-eastern Russia, and in the Caucasus. Even in these localities, he is very scarce, and the race would soon be lost, but for the care of the Emperor of Russia, who will not allow any to be shot in his dominions.

GENUS — *Bubalus*. The Buffalo.

The true buffaloes, *B. bubalus*, live only on the Eastern continent. The animal which is called by that name in America, is of another variety. They are quite large, but low in proportion to the size of their bodies. They have no hump, like the bisons, and the dew-lap is

small. They are clothed with thin, coarse, black hair. They are fond of wading in the mud and water, and therefore are usually found in marshes and jungles. In the heat of summer, they retreat to the highlands, and when they return, they are said to take advantage of the swollen streams, and float down at leisure. It is hardly possible that this can be true; but, at any rate, they swim well. Their gait is heavy. They run with their horns laid back and their noses thrust out, guided mainly by the sense of smell. They are found wild in all parts of India. By nature, they are fierce and ungovernable; but wherever the people have any use for them, they have been tamed and made to work. Their strength is so great, that they are a match even for the tiger. Captain Basil Hall gives an account of a battle between a tiger and a buffalo:

"The buffalo entered the ring quietly enough, but after looking about him, turned to one side, and, as if he felt a little bilious, overturned a tub of water placed there expressly for his use.

The tiger refused for a long time to make his appearance; and it was not till his den was filled with smoke and fire, that he sprang out. The buffalo charged his enemy in a moment, and by one furious push, capsized him right over. To our great surprise, the tiger pocketed this insult in the shabbiest way imaginable, and passing on, leaped at the ropes, with which his feet became entangled, so that the buffalo was enabled to punish him most ingloriously. When at length the tiger got loose, he slunk off to a distant part of the area, lay down, and pretended to be dead. The boys, however, soon put him up again; and a couple of dogs being introduced at the same moment, they all set at him. One bold dog actually caught the tiger by the tail; but a slight pat of the mighty monster's paw, crushed the yelping cur as flat as a board. The buffalo, who really seemed anxious for a fair stand-up fight, now drove the dogs off, and repeatedly poked the tiger with his nose, and even turned him half over several times with his horns."

When tamed, they are chiefly used for draught. When dead, only the skin and horns are of any use. The flesh is rank, coarse and worthless.

The arnee, *B. arni*, is another variety of Indian buffalo, remarkable for courage, strength and fierceness. It is sometimes seven feet high at the shoulders. Its huge horns measure ten feet from tip to tip, and are so heavy that a man can scarcely lift them. They grow outwards and backwards, and then turn down, forming a half-moon. They are not round, but triangular, and are covered with wrinkles. These creatures are very much afraid of fire; they hate red colors, and where they are plenty, no one dares wear scarlet.

The Cape buffalo, *B. caffer*, has large horns, so thick at the base that they cover the whole forehead. The beams bend downwards, and then turn upwards at the points, which are quite sharp. They spread about five feet from tip to tip. This animal is considerably lower than the Indian buffalo, but is firmer and more compact.

Its body is nearly destitute of hair; about the head and neck, it has a beard and short mane. Its hide is hard and black. It has never been tamed, and when ranging the forest alone, is dangerous to approach. There seems to be little in this creature like the common ox, although they belong to the same family. Still, we do not know how much fierceness has been tamed out of the ox, in the long training of ages; and even now, a vicious bull is seen with most safety from the other side of the fence.

A little species of ox, which is called the yak, or grunting ox, *B. grunniens*, lives in Central Asia. It is only about three and a half feet high. It has a short head, broad nose, large ears, short, slender, round, upright horns. A mass of long hair falls from the shoulders almost to the ground. The Tartars weave this into cloth, of which they make clothing, tent-covers, and even the ropes which hold up the tents.

The tail is covered with long white hair, like horse-hair, but finer. These tails are sold at a

great price. They take a fine dye, and are fixed into handles of ivory or metal. In India, they are called chowries, and are used as fans to keep away mosquitoes. Elephants are taught to use the chowrie, and to wave it about the heads of those who ride on their backs. The Chinese ornament their caps with them. The Turks use them to show the rank of high army officers. They are fastened to long staffs, as we use flags, and are set before the tent in the encampment. A pasha of three tails is almost as high in rank as a general with three stars.

GENUS — *Ovibos.* — Sheep-ox.

The last and most distant relative of the ox family which we shall mention, is the musk ox, *Ovibos moschatus;* a creature which seems midway between the ox and the sheep. It dwells in northern America, in a country generally rocky and barren. It is about the height of a deer, but broader and stouter. Its horns cover the whole forehead; they curve very much, like those of the cape buffalo. Its brown hair is

curly and matted on the shoulders, and so thick as to give the appearance of a hump, although there is none. Beneath the long hair, grows a fine ash-colored wool, which would be valuable to spin, if it could be obtained in sufficient quantity.

The musk oxen feed in flocks of twenty to thirty. They run nimbly, and climb hills and rocks with ease. If hunters fire at them without showing themselves, the poor creatures seem to fancy that it thunders, and crowd together in a mass, so that they give a good mark. If they happen to see their enemy, they are no longer deceived; they at once charge upon him, and are very dangerous. Their flesh is tolerably good when fat, unless too highly flavored with musk.

Such are some of the cattle that wander upon "a thousand hills." When wild, they have enough of courage and sagacity to protect themselves from danger; when tamed, they are man's most useful servants — the type of patient, quiet endurance. In either case, they

illustrate the wonderful fitness which exists between the various parts of the mechanism of the world. In early ages, cattle were the chief item of wealth, as they are still among the pastoral tribes which feed their herds over the wide steppes of Central Asia. The ox came to be recognized as the emblem of wealth and of prosperity; and so the Egyptians came to worship the bull Apis, whence the Israelites in the desert learned to make the golden calf—and the Hindoo Brahmin to this day deems the Zebu sacred. At first, the creature may have been merely the sign, but the sign soon became the substance, and the religion whose God was a brute, became brutal.

In the Jewish ceremony, the bullock was used as a sacrifice. It was not worshiped—it was slain. It must be without spot or blemish, the best of the herd; nothing that was deformed or in any way imperfect, would serve. This form and substance of sacrifice had, indeed, its value, as presenting continually, with ever fresh repetition, a type of the great sacrificial atonement

yet to be made; but it had a significance, more forcible, because more immediately applicable. By this means was shown the grand contrast between the true faith which worshiped Jehovah, and which offered the best of man's most valuable wealth to an unseen and spiritual deity, and that other false pretense which exalted that wealth in the form of a beast, and made it a god. The contrast was between those who worshiped the beast, and those who sacrificed the beast. The same contrast still exists between such as worship wealth, in those more refined forms which it now assumes, and those who recognize in it a means for the attainment of greater good, and who, in themselves and in their offerings, seek more fully to honor God. The world has not yet ended the worship of Apis — the golden calf is not yet dethroned.

THE BLACK BEAR. *Ursus Americanus.*

About Bears.

VERTEBRATA. MAMMALIA.

ORDER — *Carnivora.* — Flesh-eaters.

FAMILY — *Ursidæ.* — Bear-like.

GENUS — *Ursus.* — The Bear.

ALL the species of bears have great size, large limbs, and heavy gait. They walk upon the flat soles of their feet, and are, therefore, with the raccoons, called *plantigrades.* The print of the foot of a black bear, left in the soft earth, resembles very much the impression of a man's hand — fingers, thumb, and palm, being distinctly marked. This form of foot takes away much of the swiftness which

beasts of prey usually possess. The dog and cat families move upon their toes, or digits, and are called *digitigrades.*

Bears' feet have five toes, armed with large, strong claws, fit for digging and climbing, rather than for holding prey or tearing flesh. They eat a variety of food, and, besides flesh, are fond of nuts, acorns, berries, growing corn, and young grain.

They seldom attack man, unless driven by severe hunger, or provoked; but when angry, are very dangerous. They are not only savage, but solitary; making their lonely dens in the most secret and inaccessible places. In winter, they sleep in their dens, in some cavern of the rocks, or in the hollow of some old tree. Here they pass months, without food, in a torpid state, breathing so gently and slowly that one would hardly suppose them alive. As the winter passes, their fat wastes away; until, when they crawl forth in the spring, they seem to have slept off all their flesh.

There is a tradition that about the fourteenth

of February, the bears wake up and come out of their hiding-places. If they see their shadows on the snow, they think that spring has come; if not, they believe that they have waked too soon, and go back to take another nap. Will all the lads and lasses who read this, believe it as certainly as they believe that other tradition, that all the little goosies select their mates about the same month and day?

The American black bear, *Ursus Americanus*, is about four feet long and two and a half feet high, and weighs from two hundred to four hundred pounds. His head is long, nose pointed, limbs strong and clumsy, tail short, feet large, fur black or dark brown, soft and glossy.

He eats berries and nuts when he can get them, and if he can find a farmer's pig-sty, sometimes takes a tender pig for a change of diet. He makes sad work in a corn-field, both when the corn is young and when the ears are fit for roasting — or, as the farmers say, in the milk. Fences do not protect against the bear, for he clambers over as easily as any boy; but

he is so foolish as to come again, and climb at the same place, leaving his broad tracks in the soft earth. So the farmers set a gun in such a position that when the bear returns, and rears upon his hind feet, to put his fore-paws on the top rail of the fence, he may discharge the bullets into his own breast.

It is not easy to hurt the bear, except with fire-arms. He sits erect upon his hams, and strikes with his fore-paws, like a cat, warding off blows so dexterously that it is difficult to strike his head. Elsewhere, the blow would do little harm; for one might as well beat a feather bed, as the body of a fat bear.

The black bear, like most of his family, is very expert in climbing trees, and by this means is able to satisfy his excessive fondness for honey. In this pursuit, he suffers little injury, notwithstanding the fable of the bears and bees; his thick hair and coat of fat make him care as little for stings as for blows. Indeed, the bees can find a sensitive part only about the nose or eyes, and these he is willing to risk: so without

delay he thrusts his paw into the honey-comb, and licks off the honey.

When other food fails, he goes to streams or ponds and catches fish. He is found in swamps and forests throughout North America. His fur is valuable; and those who are not too fastidious, eat his flesh. It tastes like pork; and if the fat be removed, and the meat properly cooked, it will serve to satisfy hunger.

The brown bear, *U. arctos*, of Europe, much resembles the black bear of America, but is considered a distinct species.

The grizzly bear, *U. horribilis*, is the most powerful and dangerous wild beast of America. He is from six to nine feet long, and sometimes weighs as much as eight hundred pounds. His hair is longer and finer than that of the black bear, and the color varies from a grizzly gray to a light brown. The hair of the legs and feet is darker and shorter than that on the body; on the face, it is so short and pale as to make the creature seem bald; on the neck, it grows to a stiff, coarse mane.

The feet and claws are very large. The fore-foot of a specimen measured by Lewis and Clarke, was nine inches broad, and was armed with claws six inches long. These claws are not pointed, but are thin and wide, fitted to dig in the earth.

Notwithstanding his size, his unwieldy form, and his shambling gait, he runs with great speed, and his strength overcomes even that of the bison. The Indians regard him with superstitious awe, and make preparations to hunt him with many ceremonies. A necklace of bears' claws, which can be worn only by the brave who has himself killed the bear, is a mark of great valor, and entitles the wearer to peculiar honors. Since the Indian has learned to use the rifle, the risk is somewhat less than when he fought bruin with arrows and spears; yet, with fire-arms, a steady hand and sure aim are necessary, for a wounded, angry bear, is very dangerous. There can be no escape; life is staked against life.

The grizzly bear has a kinsman as strong and

fierce as himself, in the great white or polar bear, *U. maritimus*. Very few animals are found in the extreme cold about the north pole, and these are not usually as large or as strong as those of kindred species which inhabit warmer countries. The bear, however, grows to an enormous size, measuring from eight to ten feet in length, and weighing from one thousand to fifteen hundred pounds. He is as fearful a tyrant on the lonely wastes of snow and ice in Greenland and Nova Zembla, as the lion on the burning sands of Africa, or the tiger which lurks in the dense jungles of India.

This animal is usually described as snowy white, except the tip of the nose and the claws, which are black. A stuffed skin, which Dr. Kane brought from Greenland, now at the Academy of Natural Sciences in Philadelphia, is covered with short, close fur, of a tawny yellow. The head of this bear is very small, when compared with his body; the ears small and rounded; the limbs short and strong.

He feeds chiefly upon seals, fish, and the dead

bodies of whales. When he hunts the seal, he gets to leeward — the side of his prey away from the wind — and swims quietly towards him. As he comes near, he makes frequent dives, and at last comes up close to the spot where the seal is lying on the ice. If the seal tries to escape by rolling into the water, the bear is ready to seize him; if he lies still, the bear springs on the ice, kills him, and eats him at his leisure.

In these fishing journeys, now swimming and now floating upon a cake of ice, the bear is often carried far out to sea, and is driven to Iceland, or as far south as Newfoundland. In Iceland, he finds cattle and sheep, better flavored food than seals and fish; and he makes sad havoc, until the people all turn out and kill him.

Dr. Kane found the polar bears very troublesome, in disturbing the supplies of provisions which he left in store for himself. One caché was built with great care, and walled in with very heavy stones. Yet the tigers of the ice seemed to have found little trouble in breaking

in. Not a morsel of provision remained, except some which was put up in round iron cases with conical ends; these, neither claws nor teeth could open. These cases, though weighing over eighty pounds, they had rolled and tossed about like foot-balls. A tin can of liquor, they had mashed into a ball, and torn with their claws as with a cold chisel. They did not relish salt meat, but loved the ground coffee, and gnawed all the old canvas, and even the flag. They rolled the bread-casks over into the broken ice, and chewed the India-rubber cloth into all sorts of hard knots.

Next to the walrus, the bear is the chief food of the Esquimaux; and, with the fox and seal, furnishes most of their clothing. He is hunted with dogs, which are trained not to fight, but simply to annoy him, and keep him from getting away. When the track of a bear is found, the hunter examines it to find out the size and age of his game. He then follows the trail, drawn by his dogs, in his sledge. When the

bear is seen, two of the dogs are loosed, while the others continue to bring the hunter nearer.

Presently the bear stops at bay, and the hunter, loosing the rest of his dogs, grasps his lance, and prepares for a fight. If he is skillful, he provokes the animal to chase him, as if he were running away. As soon as the bear gets his unwieldy body fairly in motion, the hunter turns and runs back again, and as the bear turns after him, he thrusts his spear into the creature's neck. If he does not kill him outright, he has often to leave his spear, and run for his life. This bear does not resort to the hugging and boxing of the black and grizzly bears, except when at bay, and absolutely beset; he uses his teeth much more frequently.

Among the most curious chapters of natural history, is that which describes the ways in which animals, guided by natural instinct, provide for their young. Where, in all the frozen regions of the north, can the polar bear find a den where she may place her infants and keep them from freezing to death? The frozen earth

and the solid rock are alike too hard for digging. There are no hollow logs to creep into; and neither log or cave would protect against that bitter cold which is an hundred degrees colder than freezing water. In this extremity, both bear and Esquimaux take to the snow itself, "the covering snow," for shelter.

The Esquimaux cuts out cakes of frozen snow-crust, and builds him an oven-shaped house, like an enlarged beaver-hut. Into this den he crawls, with his wife and weans; he spreads his seal-skins on the snow floor; he hangs his seal-oil lamp to the snow-roof; he stuffs himself with walrus-meat; and then he and his all cuddle together like pigs in a sty, in a steaming, stifled air, at summer heat, which would soon suffocate a white man.

The bear does much the same. In early winter, Mrs. Bear finds a snow-drift, under shelter of a rock, where, by a little scraping, she makes a place large enough to lie in. The drifting snows soon hide her; her warm breath melts through the coverlid a hole which never quite

closes. This hole furnishes air to the sleeping bear below. Its wreath of frost-work betrays her hiding-place to her neighbor of the snow oven, if he chance to pass that way.

Here she sleeps till March. When the keenest cold is over, she digs her way out, and leads away a brood of baby bears, about as large as rabbits; large enough to withstand the cold, and strong enough to journey with the mother in her roaming for a living.

Before going into seclusion, Madame Bear had done her best to lay by a store of food, and for want of other store-room, she had packed her supply under her own jacket; she had made herself as fat as she could with diligence in such starved hunting-grounds. The wonder is, that she can carry away nutriment enough to support herself and nurse her young for three months, without eating a mouthful; but such is the fact. Mr. Bear and the other members of the family who have no babies to care for, do not go into the snow thus, but wander most of

the winter, picking up what scanty living they can.

Most bears can be partially tamed, but none can ever be made a pet. They are sullen, capricious, revengeful, cruel. Solomon compares a wicked ruler to a "roaring lion and a raging bear." Isaiah describes the universal peace which shall reign when "the earth shall be full of the knowledge of the Lord," as the time when the cow with the bear shall feed, and their young ones shall lie down together. When that day shall dawn, those whose natures have become like the natures of bears, or of other fierce and cruel beasts, will have laid aside these brutish qualities, and have taken in their place those more lovely traits which belong to the lovely and loved among men and women. Who does not wish that this happy hour may come soon in his own nature?

THE KEITLOA. *Rhinoceros bicornis.*

About the Rhinoceros.

VERTEBRATA. MAMMALIA.

ORDER — *Pachydermata.* — Thick-skinned.

FAMILY — *Rhinocerida.* — Rhinoceros-like.

GENUS — *Rhinoceros.*

ONE of my readers, suddenly placed in the midst of an Indian jungle, would quite likely be much surprised by the dense growth of strange tropical plants which would surround him, and by the deep rich colors of leaf and flower. But surprise would increase to wonder, and perhaps to terrible alarm, if, by chance, he should meet some of the animals which lurk in those dense thickets, prowl amid the canes, or glide through the rank

jungle grass. He might get a glimpse of the spotted leopard, or cruel tiger, stealing along in search of a supper. He might hear an elephant crashing, with heavy tread, through the bamboo. While admiring the gay plumes of the tropic birds, or amusing himself with the noisy chatter and comical antics of innumerable monkeys, he might be startled by a sudden movement of the deadly cobra. On every hand, he would see the tendency of that warm climate to produce an intensely vigorous form of every kind of animal or vegetable life. It would appear in the dense luxuriance of plants and trees; in the myriads of insect tribes; in the beauty of the birds; in the deadly virulence of animal and vegetable poisons; in the great size of some herb-eating creatures; and in the fierceness and strength of beasts of prey.

The huge size and unwieldy motions of one strange beast, would especially attract his notice. This creature does not wander far from the streams, like the elephant, or live much in the water, like the hippopotamus; but he loves to

wallow in the soft mire, like a huge hog. His legs are thick and short — each foot having three toes, armed with thick and strong hoofs. His skin is nearly or quite bare of hair or bristles; and, as if a little too large for him, is laid in broad folds about his neck, shoulders and thighs. It is studded with knots, like the heads of rivets on iron plate, and is so thick and tough that neither the claws of a tiger or a leaden bullet make much impression upon it. The head and neck are short; the ears of moderate size; the eyes are small, and so set in the side of the head that the creature can not see before him.

The most singular feature of this singular beast, is a large stout horn — some species have two — set, not on the forehead, as horns usually grow, but directly over the bones of the nose. The natives of the jungles call him by various names in their languages; but the Europeans have kept the old Greek word, made of *rhin*, nose, and *keras*, horn; the rhinoceros, or nose-horn.

The horn of the rhinoceros differs from all other horns, in being formed entirely of true horny substance. Those of the deer, though called horns, are composed wholly of bone. Those of cattle, sheep and goats, have a hollow cover of horn, upon a cone of bone. The horn of the rhinoceros has no bone at all, and so is not sensitive, like the horns of other creatures. It seems to be formed of a great number of hairs, or bristles, closely grown together. As each fibre has its own attachment to the skin, the horn is very firmly fixed in its place, and yet may be separated from the bone of the nose by a sharp knife. It is set where the most violent use of it can not injure the brain, and so that it can be driven with the whole weight of the animal. This gives it great power, while it may be worn quite to the stump without pain. It is very hard, and perfectly solid; it makes a fine material for handles of tools, or other articles which need a high polish.

The Indian rhinoceros, *R. indicus*, is about five feet high and nine feet long; the largest weigh

about six thousand pounds. Its horn is slightly curved backward, and is sometimes as much as three feet long, and six inches in diameter at the base. The skin is blackish-gray. Its movements are slow. It carries its head low, like a hog, sometimes plowing its horn into the ground, or crashing through the dense jungle by sheer weight. It is naturally quiet; when attacked, it becomes very furious and dangerous, charging with great fury, and ripping with its horn any creature which opposes it. From its lonely habits, the Malays call it "the recluse."

It is fond of burying itself in the soft mud, in the rainy season, and lying quiet, with its nose out. Sometimes it remains until the hot sun has somewhat baked the crust above it, which it breaks with some trouble. The natives of Sumatra are said to take an unfair advantage of any which they find in such a place. They gather dry sticks, and quietly pile a heap of brush over the poor fellow, and then set the heap on fire. The additional heat hardens the

crust so much that the animal can not get away, and is baked on the spot.

The Javanese rhinoceros, *R. javanus*, is smaller than the Indian. His skin folds are arranged differently, and he is longer and more slender. He is fond of the coffee-bush and pepper-vine, and does great mischief at night in gardens. He is sometimes tamed and ridden, or made to draw.

Until lately, travelers have described only one species of African rhinoceros, but at least four are now known. The one longest known is the "keitloa," or rhinaster, *R. bicornis*. It has a second smaller horn just behind the large horn on the nose. This kind is found throughout Africa, from the Cape of Good Hope to the Nile. It is fierce and dangerous. One is described which charged upon a heavy wagon, stuck fast in the deep sand, and with its horn lifted the wagon out of the sand and drove it forward some distance. It then turned aside and spent its fury upon the bushes.

The natives cut the thick skin of this animal

into long strips, which they beat with hammers on the ground, and so harden; they are then smoothed and sand-papered, and used for whips.

Besides the keitloa or two-horned black rhinoceros, there is the "borèle," with a single horn, also black. Like the other, it attacks any thing which provokes it. It feeds upon roots, and the branches of the "wait-a-bit" thorn—a species of acacia, whose long and numerous thorns usually cause any one who is caught by them to wait a bit before he gets clear. It does not accumulate fat, and its flesh is so tough that even Bushmen will not eat it.

The white, two-horned variety, *R. simus*, is larger than either of the others. In temper it is much milder than the black, even seeking to escape when wounded, unless defending its young. Its flesh is said to be excellent—Mr. Cumming preferred it to beef. The natives call him the "muchuco."

A fourth variety, *R. oswellii*, is quite rare. It is also two-horned, and the foremost horn projects forward, almost touching the ground

when the creature runs. This horn is very straight and long, sometimes four feet. The Africans make ramrods and clubs of it.

Many trees in the tropical forests, where the rhinoceros lives, grow very quickly, and have no firm wood, but are huge stalks, just fit for this creature to eat. His upper lip is flexible, and can be lengthened out so that he can take hold of the branches, as an elephant would with his trunk. With this lip he pulls down the branches which have most leaves and eats them first. When he has thus disposed of the branches he does not stop: he thrusts his horn as low in the trunk as he can, rips the body of the tree into laths, and then grasps huge mouthfuls in his jaws, and twists them off like so many bunches of celery.

When pursued, he runs with considerable speed, in spite of his great size and his short legs. He has a kind of shambling trot, which increases after a few moments, and carries him rapidly along. While it is true that a horse can seldom come up with him, it is quite as

much due to his cunning as to his speed. He makes from wood to wood, choosing the thickest jungle rather than the open plain. The dry trees he breaks down, and the green bamboos, which he pushes aside with his great body, spring back again with such force as to be troublesome and even dangerous to his pursuer. If the horse gets before him he halts a moment, and then dashes straight forward at the hunter. This movement defeats him, for the horse turns aside and allows him to pass, while the man slips to the ground and disables him by a cut across the tendon of the heel.

The remains of several extinct species are found in the rocks. One was disclosed by the melting of ice in Siberia. The flesh, skin and hair were all so well preserved as to show clearly what the living creature had been, and that it was well fitted to bear a Siberian winter. Fossil remains have been found in Italy and in Germany. Bones of a species not larger than the hog have been found at a great depth in France, mingled with those of extinct kinds of

crocodiles and tortoises. A fossil species is found in Nebraska.

The rhinoceros is probably the unicorn of the Bible. Some have supposed that this animal was a kind of goat or antelope. But no single horned species of either has yet been found, and it can hardly be believed that an animal so widely distributed, and so remarkable in every way, was unknown to the sacred writers, or would not have been mentioned by them. In Job we find written—

Will the unicorn be willing to serve thee?
Or will he abide by thy crib?
Canst thou bind the unicorn with his band in the furrow?
Or will he harrow the valleys after thee?
Wilt thou trust him because his strength is great?
Or wilt thou leave thy labor to him?
Wilt thou believe him, that he will bring home thy seed,
And gather it into thy barn?

The Hippopotamus.

Another beast, still larger than the rhinoceros, lives in the warm lands of Africa, and though not of the same genus, belongs to the same

family. Like the other, he keeps his old Greek name, *hippos*, horse, *potamos*, river, or hippopotamus, horse of the river, *H. amphibius*. His name teaches his habits more than his appearance, for he resembles a horse in nothing but size, and even in that respect he is only less than the elephant. His form is very uncouth; the body is bulky, round and fat; the legs are short and clumsy; the mouth prodigiously wide, and filled with large and strong teeth. The tusks of the lower jaw are sometimes two feet long. Their substance is harder and whiter than ivory, and was long used by dentists as material for artificial teeth. The thick and broad lips are beset with scattered bristles; the nostrils are small and open on the top of the nose; the small eyes are fixed high on the face, in a prominence which resembles the garret windows of a Dutch house. The tail is short, and but thinly covered with hair. When just out of the water the skin appears pale brown or mouse color, with a bluish cast on the back; the belly is flesh colored; when dry the general color is a dingy

brown. If left long without water, as happens sometimes when one is carried about for exhibition, a thick and almost bloody moisture covers the skin, and the creature seems to be in distress.

In the large rivers of Africa the hippopotamus walks about at the bottom of the streams, quite at home, raising its nose out of the water, once in awhile, for a sniff of fresh air. It is also found in inland lakes, and even out at sea—though it does not eat fish or drink salt water—probably it is swept out by the current at a flood. At night it leaves its home for food, eating the herbage which grows on the banks or in the neighboring marshes.

On land its movements are slow and awkward. Its track may be easily distinguished from that of any other animal, by the line of unbroken herbage which is left between the marks of the feet. The body is so wide, and the legs are so placed, that the feet are quite apart, and make a double track. If pursued it runs as fast as it can to the water, plunges in,

and walks away under the surface. In places frequented by man it is very shy by day; in quite wild regions it rushes out of the water boldly, overturning whatever is in its way. It does not often show any fierceness, and does no serious mischief, except to eat and trample down plantations of corn, rice, and sugar-cane, and to destroy trees. A few specimens have been taken while young, and exhibited in Europe and the United States. While young, the captives have to be fed on milk, and consume a very great quantity.

The hippopotamus sleeps among the reeds on the small islets in the rivers which it inhabits. It is sometimes shot, and sometimes caught in pitfalls. From the shape of its head, and the position of its nose and eyes, it can lift enough of its face out of water, to see and to breathe, without rising more than an inch or two above the surface.

"This animal abounds in the Limpopo, dividing the empire with its amphibious neighbor, the crocodile. Throughout the night the

unwieldy monsters might be heard snorting and blowing during their aquatic gambols, and we not unfrequently detected them in the act of leaving their reedy coverts to graze by moonlight; never, however, venturing to any distance from the river—the stronghold to which they betake themselves on the slightest alarm. Occasionally, during the day, they were to be seen basking on the shore, amid ooze and mud; but shots were almost constantly to be had at their uncouth heads, when thrust from the water to breathe; and, if killed, the body rose to the surface. Vulnerable only behind the ear, however, or in the eye, they require the perfection of rifle practice, and after a few shots become exceedingly shy, exhibiting the snout only, and as instantly withdrawing it. The flesh is delicious, resembling pork in flavor, and abounding in fat, which is deservedly esteemed the greatest of delicacies. The hide is upwards of an inch and a half in thickness, and being scarcely flexible, may be dragged

from the ribs in strips, like the planks from a ship's side."

Cumming hunted the hippopotamus in the rivers of South Africa for the tusks. The first that he shot escaped into deep water and were lost. This poor success aroused his pluck, and when he next wounded a sea-cow, while she was floundering about in the water, he rushed in and tried to guide her on shore by seizing her short tail and pulling her about this way and that. She was too much crazed by the shot to be controlled even thus, and kept swimming about in circles. Then he cut slashes in the skin, passed a rope through, and with oxen dragged her on shore and dispatched her. He found herds of thirty and forty, and once more than seventy of these huge fellows tumbling about together, in their uncouth way, in the sluggish waters of the Limpopo.

The natives take the hippopotamus with a harpoon, as if it were a whale or a walrus. The harpoon has a pole or shaft ten or twelve feet long, and three or four inches thick; a barbed

iron point fits loosely in a socket in the end of the pole, and is fastened to it by a rope of many strands. As soon as the barb is fast to the animal, it comes out of the socket in the shaft, and gives the pole no power as a lever to pry it out of the skin. A strong line is fastened to the pole, and a buoy to the end of the line.

The hunters float quietly down on a raft into a herd of sea-cows. When one is near enough to the raft the harpooner throws his whole weight upon the pole and drives the barbed iron into the body of the hippopotamus. The wounded beast dives to the bottom, but he can not escape. The men hasten to take the line to the shore, and get a turn round a tree. If there is no time for this they let him go, and follow him with their canoes, the buoy showing always where he is. When he comes to the surface they attack him with javelins. Not unfrequently he turns upon his pursuers, staves in or overturns the canoes, and even seizes some poor fellow in his huge jaws, which, perhaps, cut his victim quite in two.

The thick and strong hide, like that of the rhinoceros, is cut into strips, dried, rounded, and used for whips. The Dutch colonists call the fat zee-koe-zpeck, or sea-cow's bacon.

The hippopotamus is supposed to be the creature called behemoth in the book of Job.

The sojourn of the Israelites in the land of Egypt must have made them familiar with it, and with the rhinoceros. Others think the animal referred to is the elephant.

Behold now behemoth, which I made with thee:
He eateth grass as an ox.
His bones are as strong pieces of brass:
His bones are like bars of iron.
He lieth under the shady trees,
In the coverts of the reeds and fens.
The shady trees cover him with their shadow;
The willows of the brook compass him about.
Behold, he drinketh up a river and hasteth not:
He trusteth that he can draw up Jordan into his mouth.

Job xl. 15-23.

THE KANGAROO. *Macropus major.*

About Several Funny Fellows.

THUS far the creatures which we have talked about have been arranged in families, by some peculiarities of form or habits. In this chapter we will describe several animals which are only alike in being unlike every thing else. They have no relatives; they are oddly shaped; they have queer habits; they seem to have been made to show how far nature could wander from her general plan, and yet adhere strictly to its conditions.

Two of these funny fellows live in Australia, where strange freaks of nature are very plenty. In fact, at that end of the world nearly every

thing seems to be reversed. Summer and winter change places. Cold winds blow from the south, and northeasters are warm; the north side of a tree or a house is the sunny side. The thick end of the pear is next the stem, and the stone of the cherry is outside the pulp.

One of the queerest of its queer creatures has quite a variety of names. We will use that which seems to have most meaning for our unscientific ears, and call it the duckbill, because its jaws are fashioned into two broad plates, curiously like the bill of a duck. It is also called the watermole, because of its soft, mole-like fur, and its habit of living in the water.

Some naturalists call it *platypus*, or broadfoot. Others give it the sounding title *ornithorhyncus paradoxus*, or bird-snouted puzzle. The natives of Australia call it mallangong, or tohunback, or more often tambreet.

When the skin of the duckbill was first brought to Europe, naturalists thought that some person was trying to impose upon them

by fastening the bill of a bird on the skin of an animal, but an examination of the bones of the skull proved that they were mistaken.

The duckbill is about twenty inches long. His body is long and flattened, and is covered with thick soft fur, dark brown above and white beneath. The bill forms most of the mouth, and the only teeth are in the back of the mouth, two on each side, with flat tops and without roots. The feet are five-toed and webbed. The web of the fore feet extends loosely beyond the toes, and falls back over the strong claws when the animal digs. The hind feet have each a spur, which is hollow, and connected with a gland or bag, made like the poison bag of serpents. For this reason it has been supposed that a wound from the spur would be dangerous, although there is no proof of the fact. There is no external ear, and the eyes are small, though bright. The motions of the jaws when seeking food in the mud and water, are like those of the duck.

Wood says: "On looking at a living duck-

bill, few would set it down as an excavator of the soil, yet it is a burrower, and makes tunnels of some length. The soft broad membrane that extends beyond the claws while the animal is walking or swimming, and in the latter case forms a paddle by which the creature can propel itself swiftly through the water, falls back when the foot is employed for digging, and aids in flinging back the soil which its claws have scraped away. The round body is admirably adapted for traversing the burrows, though the stuffed specimens seen in museums give but little idea of such capacity. As a general rule, these specimens are much too long, too stiff, too straight, too flat and too shriveled. During life the body is round, and the skin hangs in loose folds around it, having a very curious aspect when the creature is walking upon land. The duckbill is, in fact, so very odd a being that dogs, which see it for the first time, as it scrambles along with its peculiar waddling gait, will sit and prick up their ears and bark at the strange animal, but will not

dare to meddle with it, while cats fairly turn tail and scamper away from so uncanny a beast.

"The hair with which the body is so densely covered is admirably suited to an animal which lives in the water, or underground. Next the skin there is a thick, close coating of woolly fur, through which penetrates a second coating of long hairs, which are very slender at their bases, and can therefore turn in any direction, like those of the mole. The eyes are fuller and rounder than might be expected in an animal that passes so much of its time underground, but they are defended from the earth by a remarkable leathery flap, which surrounds the base of the mandibles, and looks very like the leathern guard of a foil. This curious appendage has probably another use, and is intended to prevent the bill from being thrust too deeply into the mud when the animal is searching for food."

The duckbill makes his home in the bank of some stream, usually where the wide and still pools are found. He makes two entrances to

his house, one above the water and one below the surface, so that he may escape either by diving, or through the leaves which always carefully conceal the upper opening.

When the foliage is put aside, a hole of moderate size is seen, and in the soft mud about it the track may usually be found. By the freshness of the track, and the direction it takes, the natives judge whether the duckbill is at home or not, and so if it is best to pay him a visit. If they think he is there, a long stick is thrust in the hole, and then pits are dug down to the stick. Then the stick is thrust forward again, and so the windings of the burrow are traced, sometimes for fifty feet. They find scooped out at the end of the burrow a space of an oval form, lined with dry weeds and grass on which the young are placed. Sometimes as many as four young are found in one nest, but usually only two.

The duckbill is very strong and active. One slips out of the hand almost as easily as if it were oiled. It is a very expert climber. The

life of the animal is spent mostly in the water and in its burrow. When swimming it resembles a bundle of weeds, rather than a living, moving thing, but it can not remain long under water without great fatigue, and would soon drown if there were no way of escape.

THE KANGAROO.

Another curious class of animals of this far off land is the family of kangaroos, *macropus* or *long footed.* The first of these creatures was discovered in Australia, by Capt. Cook, in 1770. When first seen it was thought to be like a grey-hound, because of its slender form and great swiftness. Soon another was chased with hounds, but he speedily escaped, and a specimen was not obtained until one was shot.

The kangaroo, though quite unlike any thing we are accustomed to, is by no means ungraceful. The head is much like that of a deer; the eyes large and kind; the mouth small; the ears rather large, pointed and upright; the neck thin, and beautifully shaped. The fore legs are

very short, and have each five toes, furnished with long hooked claws. The hinder feet have only four toes; one of them is very long and strong, and is armed with a stout, hoof-like claw.

The tail is very thick and long, and is used like a third leg, making the creature seem to sit on a three-legged stool. It feeds resting on its fore paws, as well as its hinder feet, but when alarmed it raises itself on its powerful haunches and bounds away with great speed. The hind feet are also a means of defence, for when dogs overtake them the kangaroos seize their pursuers by their fore feet, and tear them asunder by a single blow of their strong hinder feet.

The kangaroos gather in small herds, led by the older males, and range the country, feeding on grass and herbage. About forty species are known, varying in size from a rat to the greater kangaroo, *M. major*, which is the largest animal of Australia. It is six feet high as it sits upright, and weighs about two hundred pounds; its tail is about three feet long, and

four inches thick at the base. Its flesh is said to be nutritious. It is easily tamed.

The natives take the kangaroo with the boomerang. This is a flat piece of hard wood, usually twenty to thirty inches long, two or three inches wide, and half or three-fourths of an inch thick. It is bent in the middle, so that the two arms would cut out about one-third of a circle.

The natives make this piece of wood do wonderful things. As they throw it they give a peculiar twist which sends it forward for a space, and then makes it leap upward in the air and return in a circle to the place whence it was thrown, or even far in the rear. Sometimes it is thrown at the ground, but leaps over a tree and strikes an object on the other side. These weapons have been made in England and America, but it is difficult to get one that will fly, and none but a native Australian can make them perform all the strange freaks which they are capable of doing. They are used against the kangaroos with great

effect, stunning them, or breaking their legs so that they can not escape.

The tree kangaroo, *Dendrologus ursinus*, hops about in the forests, and has curved claws to help it hold to the branches of the trees.

Another variety is called the jerboa kangaroo, or the brush-tailed bettong, *Bettongia penicillata*. The word bettong is a native name for a class of small kangaroos which have short and round heads, quite unlike the long deer-like heads of the larger kinds. The brush-tailed bettong is about as large as a hare, and has a tail not quite a foot in length. It is a pretty creature, active, elegantly shaped, with white streakings on its back, a grey-white belly, and a jetty tuft on the tail.

The bettong makes a nest for itself, partly below the surface of the ground, partly above it. It seeks out a moderately deep cavity, near a high tuft of grass. Over this hole it builds a roof with leaves and grass, not higher than the surrounding herbage, and as like it as possible. If it can not find grass of a suitable length near

by, it goes away and gathers it. When it has collected a bunch of grass, it wraps its tail around the sheaf and jumps away to its nest, carrying the bundle along, as a man carries his umbrella under his arm. After the nest is finished the bettong always closes the entrance carefully when she leaves home, pulling a tuft of grass over the door. Europeans do not easily find these houses in the grass, but the natives seldom pass one without seeing it, and as the creature is usually at home and asleep during the day, they dash their tomahawks in the midst and kill or stun the sleepers.

THE OPOSSUM.

There are other funny fellows in the world beside those which find a home in Australia. One, common in the Southern States, is quite as queer as those we have been talking about. Indeed, he is a kind of distant cousin of the kangaroo, as both belong to the order called Marsupialia, or pouched animals. This means that the mothers have a kind of pocket, in

which they carry about their young while too feeble to walk; even after the little fellows are able to run alone they hop away out of sight into this nest when any danger threatens.

The opossums are the only family of Marsupials which live in America, and they are found nowhere else. The others are all confined to Australia and the adjacent islands; of the animals there found more than one hundred species belong to this order.

The largest of the opossums is hardly larger than a cat, and the smallest is about the size of a mouse. About twenty species are known.

The common, or Virginia opossum, *Didelphys Virginiana*, is about twenty inches long to the tail, which is about fifteen inches. Its hair is whitish, with brown tips, which give it a dusky hue. From the length of the fur, and its way of standing out in every direction, the animal seems larger than it really is. It has a long, sharp face, and a wide mouth, full of sharp teeth; ears thin, naked, round and dark, edged with a border of white; legs short; feet armed

with short claws. The tail is thick and black, and covered with small scales.

Its home is in the tree tops. It forages chiefly by night, eating fruits, eggs, and small animals, which it sometimes finds in the poultry-yard. It uses its tail as some of the monkeys use theirs, like an extra hand, climbing with it, and swinging by it from branch to branch. The young, when too large to live in the pouch, sit on the mother's back, and twist their tails about hers to keep from falling off.

The negro boys take great delight in hunting "'possums," usually in the autumn after the first frost. When the creature sees that it is in danger, its defence is in its cunning, rather than in its swiftness or its strength. It does not flee, but lies close to the branch on which it was clinging. If a dog has pursued it, and the master of the dog does not appear, the opossum climbs to a convenient place, out of the dog's way, and sits quietly, not troubled by the constant barking. But the sharp, quick bark of the dog often gives information that a

'possum is "treed," and the hunter hastens to the spot. The opossum, when it sees the negro climbing for it, ascends to the topmost bough, and clings as closely as it can, until the violent shaking throws it to the ground. Then, if the dog does not seize it, it often contrives to steal away in the underbrush and escape.

Audubon writes of the opossum:

"Methinks I see one at this moment slowly and cautiously trudging over the melting snows, by the side of an unfrequented pond, nosing as it goes for the fare its ravenous appetite prefers. Now it has come upon the fresh track of a grouse or hare, and it raises its snout and sniffs the pure air. At length it has decided on its course, and it speeds onwards at the rate of a man's ordinary walk. It stops, and seems at a loss in what direction to go, for the object of its pursuit has either taken a considerable leap, or has cut backwards before the opossum entered its track. It raises itself up, stands for awhile on its hind-feet, looks around, snuffs the air again, and then proceeds; but now, at

the foot of a noble tree, it comes to a full stand. It walks round the base of the large trunk over the snow covered roots, and among them finds an aperture, which it at once enters.

"Several minutes elapse, when it reappears, dragging along a squirrel already dead, with which, in its mouth, it begins to ascend the tree. Slowly it climbs. The first fork does not seem to suit it, for perhaps it thinks it might there be too openly exposed to the view of some wily foe, and so it proceeds until it gains a cluster of branches, intertwined with grape vines, and there settling itself, it twists its tail round one of the twigs, and with its sharp teeth demolishes the squirrel, which it holds all the while with its fore-paws.

"Traveling through the woods, perhaps on the ground, perhaps aloft, from tree to tree, it hears a cock crow, and its heart swells as it remembers the savory food on which it regaled itself last summer in the neighboring farmyard. With great care, however, it advances, and at last conceals itself in the very hen house. Hear

the screams of one of your best chickens that has been seized by him! The precious hen under which you last week placed a dozen eggs or so is now deprived of them. The opossum, notwithstanding her angry outcries and ruffled feathers, has consumed them one by one; and now, look at the poor bird as she moves across your yard; if not mad, she is at least stupid, for she scratches here and there, calling to her chickens all the while.

"But suppose a farmer has surprised an opossum in the act of killing one of his best fowls. His angry feelings urge him to kick the poor beast, which, conscious of its inability to resist, rolls off like a ball. The more the farmer rages, the less does the animal show resentment; at last there it lies, not dead, but exhausted; its jaws open, its tongue extended, its eyes dimmed; and there it would lie until the bottle fly should come to deposit its eggs, did not its tormentor walk off. 'Surely,' says he to himself, 'the beast must be dead.' But no, it is only ''possuming,' and no sooner has its enemy

withdrawn than it gradually gets on its legs, and once more makes for the woods."

A cat is said to have nine lives, but this fellow has at least twice as many. One may have every bone in his skin broken and his head mashed, and still creep away. Yet it will walk into the rudest traps, such as a commonly shrewd rat would despise. When caught it is easily tamed, but does not make an agreeable companion, or pet, as it has a very powerful and unpleasant smell, whenever it is irritated or excited. Its flesh is white when cooked, and the negroes think it very good, especially in autumn, when it is fat. A single trial of it is usually enough to satisfy the curiosity of a stranger.

The nest of the opossum is commonly made in some protected place, like the hollow of a tree, or the shelter of some old root. The creature often walks into the house of some other animal and takes possession, and has even been believed to eat the rightful owner out of house and home. A hunter who has thrown a

rifle-ball through a squirrel's nest, has been surprised to see an opossum fall dead to the ground. It has been known to take possession of the nest of the Florida rat. Its own nest is composed of moss and dried leaves.

THE ANT-EATER.

The last family of funny fellows, which we shall mention, is that of the ant-eaters. In tropical countries immense swarms of ants are found. These build great houses, dig long tunnels, march out by countless throngs, forming grand armies, under regular officers, with arranged brigades of workers and fighters. There are the agricultural ants, which sow, cultivate, and harvest grain; the amazon ants, which capture slaves, and keep them in servitude; the driver ants, which drive before them, or destroy, every living creature; the celebrated white ants or termites, so destructive to any thing fibrous, or wooden; the foraging ants, the parasol ants, and many other species. These

wonderful insects we propose to describe more fully in another volume.

All varieties of ants are in turn the prey of a family of quadrupeds which feed entirely upon ants, and are called ant-eaters. The members of this family are distinguished by a long head, a small mouth, and a long, flexible tongue, with which food is gathered. When the tongue is thrust out at full length it resembles a great red earth-worm, and twists and coils about as if it had a life of its own. As it wriggles into an ant-hill the ants crowd upon it, are caught by the slimy saliva which covers it, and carried into the mouth of their devourer.

The aard-vark, or earth-hog, *Orycteropus capensis*, lives in South Africa. It is about five feet long, including the tail, which is nearly two feet long. Its powerful fore-legs are armed with stout claws, with which it is said to dig faster than a man with a spade.

It is seldom seen by day. At night it makes its way to the ant-hills. With its strong claws it tears a hole in the side of the hill. The ants,

like the people of a walled city whose defences have been overthrown by an earthquake, or battered down by an enemy, run hither and thither in great dismay, while the maker of the mischief flings his slimy tongue among them, and scoops them into his mouth by myriads. The ant-hill, thus stripped of its inhabitants and left a mere stony shell, becomes a den for jackals, or a lurking place for serpents. The Kaffirs may use it for a tomb.

Three species of ant-eaters live in South America. The largest is called Tamanoir, or great ant-eater, or ant-bear, *Myrmecophaga jubata.* It is about three and a half feet long, and has a tail nearly as long as itself, covered with very long coarse hair, like a heavy plume. The color is brown, with gray on the head and face, and a black band round the throat and over the shoulders. The fore feet have long curved claws, fit for digging, but not for running; so, when it moves, it folds its claws under the bottom of its feet, and walks on the outer edges, with a very awkward and toilsome gait. The

ant-bear makes no burrow, but sleeps under the open sky, using its tail for a blanket. When it sleeps it rolls itself into a ball, wrapped up in its blanket, while its coarse, bushy hair makes it look more like a bundle of hay than like a living thing.

The little ant-eater, *Cyclothurus didactylus*, or "two-fingered twisted-tail," is about twenty inches long, including its tail. It dwells mostly in trees, and its habits seem to be a compound borrowed from the squirrel and the woodpecker. Like the squirrel it sits erect upon its hind legs, like the opossum it twists its tail round a limb to steady itself, and like the woodpecker it searches for insects in the crevices of the bark, and catches them with its long and flexible tongue. It is covered with soft, curled fur, of a pale yellow-brown. Like its larger relations it is active by night, and sleeps by day, with its tail securely twisted round the branch on which it sits.

THE SABLE ANTELOPE. *Ægocerus niger.*

About Antelopes.

VERTEBRATA. MAMMALIA.

ORDER — *Ruminantia.* — Cud-chewers.

FAMILY — *Cavicornia.* — Hollow-horned.

GENUS — *Antilope.* — The Antelope.

RACEFUL as a gazelle; swift as an antelope; gentle as a fawn. Such are the comparisons, common in every mouth, which are suggested by this large family of beautiful creatures. They dwell in all the warmer regions of the earth—in the far stretching sunny table-lands of Asia, on the rocky pinnacles of the Alps, the arid plains of South Africa, and the broad slopes of the Cordilleras. All they

ask is, plenty of room for the use of their fleet limbs, and freedom from the deadly weapons which man lifts against them.

The family of antelopes seems to be a connecting link between the deer and the goats. Their size, shape, the nature of their hair and its color, with their fleetness, are points of likeness to the deer. Their horns are materially different, being, like those of goats and oxen, hollow at the base, resting on a solid cone of bone, and never shed. Of their long and slender legs, the hind-legs are usually longest, whence they have great speed, as well as better security when clambering about the steep places to which they love to resort.

The family contains many species, which seem to form a large circle, approaching, in some of its members, several other genera of ruminating animals. The gazelle is much like a deer; the chamois is more like a goat; the eland is like an ox; the gnu is a queer mixture of ox and horse, unlike either. In nothing are they so much like each other as in the nature

of their horns. These are two, sometimes four, usually long, straight or slightly curved, and twisted or spiral, but never coiled about like those of the sheep.

The gazelle, *Gazella dorcas*, dwells in northern Africa, in large herds. The constant prey of both man and beast, its only safety is in its speed. When attacked it will not fight unless hemmed in where it can not escape; indeed, it is too small and too weak to offer any effective resistance to its foes, and it can but flee. The only exception occurs when the attack is made upon a herd of some size. Then the males form a ring about the females and the young, their sharp horns, like a row of bayonets, bristling on every side against the foe. They seem to know that this is their only form of defence; they keep their ranks with much spirit, and sometimes even make their phalanx the means of attack.

The ariel gazelle of Arabia is so like the dorcas that it is considered a variety of the same species. This, with another, the Persian

gazelle, or jairou, is the creature so often sung by the Eastern poets, praising especially its large, lustrous eyes. The word *antilope*, the generic name, literally means "bright eyes." It was the highest compliment to a lady's eye to compare it to the soft and beautiful eye of the gazelle. The temper of this creature is very gentle and teachable; it is often kept in Eastern households as a much loved pet.

Its height at the shoulder is only about twenty-two inches. Its color is light fawn on the back, a little darker on the sides, and pure white beneath. The face is marked with streaks of dark brown and white.

Its motions are so very light and graceful that it seems to tread on the grass without bending a single green blade, and to fly through the air without effort. At its greatest speed it thrusts out its nose and lays its horns upon its back, skimming the ground so swiftly that the fleetest long-bodied and long-legged greyhounds can not overtake it. Only trained falcons can catch it in fair chase. These fly at the creature's

head, then soar into the air and return for another stroke, and thus, by repeated assaults, bewilder and delay it, until the hounds come up and capture it.

When feeding, the gazelle, like all the antelope family, is very shy. The herd always place sentinels on the watch: if their keen eyes, quick ears, or acute smell, suspect danger, the whole herd is instantly in flight. But the craft of man is superior to the instinct of the wariest creatures. When the gazelle is hunted, not for the sport of seeing it run, but for its flesh or skin, a space a mile or more square is enclosed by a wall, or better, by a fence of trees and bushes. The fence is made so close that the animals can not get through, and so high that they can not leap over, except at certain places left purposely low; here they jump only to fall into deep pits prepared for their destruction. The chief of the flock leaps first, and the others follow, one by one. Thus herd after herd are trapped, and all are slain. Their skins are

before me, and had some difficulty in convincing myself that it was a reality which I beheld, and not the wild and exaggerated picture of a hunter's dream. During this time their vast legions continued streaming through the neck in the hills in one unbroken compact phalanx."

Flocks of sheep, large animals, and even the lion, have been entangled in these immense herds, and carried along by the irresistible tide of moving creatures.

As these great herds move over the country the foremost are likely to eat up all the forage, leaving only dry and barren fields for those who follow. But the first, having the choice of pasture, soon become satisfied; they give place to the hungry ones behind, and fall into the rear of the column. The next, in turn, do the same, and thus there is a constant change of place—hungry ones pushing to the front, while those in front fall to the rear.

The spring-bok is rather larger than the dorcas gazelle. Its general color is light yellowish brown; the sides are marked by a broad

band of chestnut; the tail is white above and black beneath; from the tail, a little way along the back, runs a stripe of white, which appears only when the creature jumps — whence the Dutch also call it pronk-bok, the showy buck.

The sasin, *Antilope bezoartica*, is the antelope of India. It lives in herds of fifty or sixty, led by a single buck. It is about two and a half feet high at the shoulder. Its horns are long, spreading, spiral, and marked with rings. Its color is grayish brown on the back, white below; the outsides of the legs, the feet, and the end of the tail, are black. As its flesh is dry, hard, and tasteless, it is hunted only for the sport of the chase. Because of its exceeding swiftness, covering twenty-five or thirty feet at a bound, and rising even ten and eleven feet from the earth, it can be hunted only by hawks, or by the chetah, a large creature of the cat kind, trained for the purpose. This animal does not course for its prey, like a hound, but creeps up stealthily until within reach, and then secures it by a few quick bounds.

A very pretty antelope is the klip-springer, *Oreotragus saltatrix*. This grizzled-brown little fellow is only about twenty-one inches high. Its hoofs are small and sharp, and it stands only on their tips. It lives in rocky places, and delights to perch on a narrow shelf, its feet all drawn together beneath it, and to peer out over a height which would be death if a single hoof should slip. When startled it springs up the steepest precipices, jumping from one little projection to another, like an animated India-rubber ball, and it soon puts itself out of the reach of even a rifle. The natives of South Africa suppose that the cry of the klip-springer attracts rain; in a dry time they surround a rocky hill where the little fellows live, and if possible catch a few alive. The poor creatures are then paraded about the kraal, or village, while the rain-maker pinches them to make them scream. If these and other arts fail, as in that dry country is very likely, the magician lays the blame to some unlucky act, or to the

presence of something—ivory for instance—which is thought to be unfavorable to rain.

The madoqua, *Neotragus saltiana*, is only fourteen inches high at the shoulder. Though so small, its legs are long in proportion to its size, and the little creature seems too frail to resist the slightest breeze. It is as beautiful as it is small. Its color is glossy silver-gray above, chestnut on the sides, and white beneath. It lives in pairs, in the mountains of Abyssinia.

The least of the family is the pigmy antelope of Guinea. It is hardly larger than a rabbit, being only fifteen inches long, and eight inches high at the shoulder.

The water-buck, *Kobus ellipsiprymnus*, is among the most beautiful of South African antelopes. Its height is about four and one-half feet; its horns about thirty inches long, spreading like a lyre; its color, brown, with a grayish white oval spot about the tail. Its flesh is so strongly scented that even the natives can not eat it. It is very timid, and when alarmed, at once takes to the water. This habit serves

as its best protection against leopards and lions, for they are no more willing to wet their feet than the domestic cat.

The sable antelope, or potaquaine, *Ægoceros niger*, is described by Gordon Cumming as follows:

"Cantering along through the forest, I came suddenly in full view of one of the loveliest animals which graces this fair creation. This was an old buck of the sable antelope, the rarest and most beautiful antelope in Africa. It is large and powerful, partaking considerably of the nature of the ibex. Its back and sides are of glossy black, contrasting beautifully with the belly, which is white as the driven snow. The horns are upwards of three feet in length, and bend strongly back with a bold sweep, reaching nearly to the haunches."

The gems-bok, *Oryx gazella*, is another of the creatures in which the ancient unicorn has been recognized. Its horns are very long, straight and erect; when the side of the animal is seen one horn may conceal the other. It has the

erect mane, long sweeping tail, and general outline of the horse, with the deer-like head and cloven hoofs of the antelope. The full grown male measures three feet ten inches at the shoulder.

The gems-bok thrives in dry plains, where, for months at a time, no water can be found. Cumming asserts that it never, by any chance, tastes water. The arid soil produces a large oval bulb, called the water-root, six to ten inches in diameter, and full of an insipid juice. Other plants have thick juicy leaves, while a kind of bitter water-melon abounds. All these vegetables are used by the natives as both food and drink. The gems-bok digs out these bulbs, and thus supplies his system with moisture. Even the elephants plow the ground with their tusks, for the grateful roots.

The flesh of this antelope is excellent. At certain seasons it becomes quite fat, and can be more easily chased: but it is always very swift, and exceedingly shy and suspicious. It can be hunted only on horseback, and captured only

after a long and severe chase. No animal of the country is fleeter or more enduring.

The straight horns, elegantly curved in a spiral pattern about the lower half, are very dangerous weapons. Even the lion has been overcome by their sharp thrusts. Dr. Livingstone witnessed the attack of a lion upon a gems-bok. At each spring the antelope received his enemy upon his horns. For a time his failures only enraged the lion, making him attack the more fiercely. At length he gathered all his strength for a final and decisive leap, but the gems-bok buried his horn to its root in the lion's breast. For a moment the two beasts were motionless; then the gems-bok slowly backed away, withdrew his horn, and the lion expired. The victorious antelope threw up his heels and trotted away, seeming to have received not a scratch in the fight.

The oryx, *Oryx leucoryx*, may be distinguished from the gems-bok by the curvature of its horns. It can use them with the same quick,

dangerous skill; it is very unsafe to approach a wounded oryx, even when he is lying on the ground.

The eland, *Oreas canna*, most resembles the ox. A full grown specimen is eight or nine feet long, six feet high at the shoulder, and will weigh one thousand pounds. Being heavily built, it is easily taken; the hunters often prefer to drive it near their camp before killing it, to save themselves the trouble of carrying home the meat and the skin. Like the gemsbok, it can live for months together without a drop of water. Its color is reddish fawn on the upper parts, and white beneath; the head and neck ashy gray. One variety is striped on the back and sides. Its size, its gentleness, and the excellence of its flesh, have induced the owners of large deer parks in England to try to domesticate this animal, and the attempt has partially succeeded.

In Asia an ox-like antelope is found in the nylghau, *Portax picta;* the name signifies, in the Persian language, "blue ox." Its color is

slaty-blue; the long neck bears a black mane; the hind legs are shorter than the fore legs; the horns about seven inches long, straight, round, and smooth. It dwells in the forests of India, coming forth by night to forage on the corn-fields in its neighborhood.

The violent temper of the nylghau can not be trusted even when the animal is tamed or confined. It takes offence at the slightest cause, and at once attacks that which it dislikes. One which was kept in a yard was so provoked at a laborer, who merely passed by, that he completely broke down the wooden paling which fenced him in. Another which had been reared from a fawn suddenly turned upon his master and killed him.

When making its attack the nylghau drops upon its fore-knees, moves on in this position until within suitable distance, and then suddenly darts forward like an arrow, and with a force which no creature can withstand. Neither its flesh or its skin are of much value, and it is hunted only for the excitement of the chase.

The gnu, sometimes called the horned horse, has the body, neck, and tail of a horse, the legs of an antelope, and the head and horns of an ox. There are several varieties, all of which the Dutch colonists of South Africa call "wildebeests," wild cattle. They are suspicious, shy, curious, and cross. When a strange object is seen they spring suddenly into the air, pawing and capering, and then follow each other in a large circle about the intruder. After a round or two they halt suddenly, and close in together, while the old males begin to fight, charging with their horns, and dropping on their knees at every plunge.

The curiosity of the gnu is fatal to him. The hunter has only to find a herd and stay in his place; if he do any thing to attract their attention, even waving a red handkerchief, they will presently be charging about him, and he may take his choice of the herd, unless, indeed, they give him so hot a reception as to make him get away from their company to seek his own safety. Cumming found an old gnu disa-

bled by getting his fore-leg over his own horn probably in fight.

The ordinary gnu, *Connochetes gnu*, is about three feet nine inches high and six feet long. The horns bend down by the side of the face, and then turn back sharply. The color is brownish black; the mane black.

The brindled gnu, *C. gorgon*, has a smooth face and black skin, brindled with gray.

The most notable of the goat-like antelopes is the chamois of the Alps, *Rupicapra tragus*. This animal is about three feet long and two feet high; its hair is long, deep brown in winter, and fawn color in summer; head pale yellow, with a dark band on either side of the face; horns six or seven inches long, and hooked at the tip. The hooks on the horns are not, as some have supposed, to help it up the steep rocks which it loves to climb, but only for defence, or ornament, like those of other antelopes. It has, however, a kind of second, or false, hoofs on its hinder feet, which help it very much as it goes down the ledges. It puts

its fore-feet close together, and presses its hind legs flat against the rock; the false hoofs catch upon every slight projection, and check it upon the first shelf that is broad enough to stand on. But, though skillful in scaling rocks, and very swift on the ground, its sharp, hard hoofs make it as awkward on smooth ice as a pig.

The chamois is very wary. It never feeds without first posting a sentinel, whose shrill whistle, when any thing is seen, heard, or smelled, which seems suspicious, puts the whole herd to instant and distant flight. The mark in the snow of man's foot will stop it in full career, and send it bounding away in a new direction. All its senses are exceedingly acute. Hunters who have been trained from boyhood to climb the glaciers, and scale the precipices of the Alps, can hope only occasionally to come within long rifle range of the chamois when at large upon its native cliffs.

Wild as these creatures are, if taken when young they may be readily tamed. A pair of domesticated chamois are said to have been

very inquisitive, prying into every thing, the cook's basket, and even the coal-man's bags. The coal-man they always pretended to fight, but when he came near they would spring to a great height upon any wall or shelf out of his reach, which they could find. As the man retreated they returned to the charge, but would never allow a finger to touch them.

The only American member of this family is the prong-horn antelope, *A. Americanus.* It ranges over the plains of the great west from the Missouri to the Pacific. It is about four feet long and three feet high; the horns are hooked, like those of the chamois, and are peculiar in having a prong or fork. The hair is coarse and thick; the color above, yellowish brown, the under parts, and a patch about the tail, white.

M. rattus, has almost vanished from England since the brown rat came over from the continent. From the sea-port they journey, free of cost, by every canal-packet and railway. The newest town in the far west is supplied with rats and whiskey by the first steamboat which ties to the stumps on its river bank.

A wheat stack, or grain bin, may be made secure from rats, if built at a little distance from any other house, and raised from the ground on posts. A broad, flat stone, or an inverted tin pan, on each post, increases the security. If a rat, by any means, gets into a crib so built, he can not stay, for he must have water every day, and when once he has gone for a drink, there is no way for him to return.

But the barn, or the cellar, is not shut against him so easily. Digging in the earth is fun to him; his burrow is soon below the cellar-wall, and he is inside. His sharp teeth make short work of a cemented floor, and a well-burned brick is not a sure barrier. If the mason, in haste, left a corner filled with mortar instead of

more solid stone, the rat is sure to find out his advantage, and an entrance into your citadel. A rat-hole once made may be covered with sheet iron, or plugged with a stone, or with a handful of mortar filled with broken glass; but the same perseverance which gnawed the first hole, will soon make another, if the rat wishes to enter. A dwelling house in Chicago was seriously damaged by water from a lead pipe which a rat had bitten through in the progress of his excavations.

The smell of the rat is very acute; a trap will be nearly useless, unless handled in gloves which have been scented with anise or carraway. A trap which kills or maims its victim may succeed once or twice, but no more. The cry of the wounded brings his fellows, who considerately eat him up, and learn to shun his fate.

Quick poisons, as arsenic and strychnine, have this advantage, that as the dying rat is almost sure to be eaten, the poison is passed from one to another; but if one is not devoured, his decaying body may prove a great nuisance, besides

the danger from the careless handling of such deadly drugs. A dose of tartar emetic has proved a very effectual ban, for a time. It is supposed that the inward uneasiness caused by this medicine, intimates that the place is unhealthy, and suggests a change of residence. The rats of that family never return, but the scouts of another soon find the empty house, and take possession of the rat-abandoned property, without ceremony.

If you propose to keep chickens, beware of rats. Old Brownie, on her nest of choice eggs, has patiently sat out her three long weeks, and the box is all alive with fluffy down. Did you wonder why she always sat looking that one way? The old bird knew where the rat prowled, and her sleepless eye has never winked so tight as not to waken at the slightest rustle of the straw, while the low growl, and the quick thrust of beak, warned the intruder away. There is fresh blood on the straw now, do you see? The singing eggs enticed the rat a little too near for his comfort or safety.

The proud mamma, fussy and happy, leads out her fifteen chicks. The wee things thrive apace, and you begin to know one from another by the sprouting quills and budding tails. One bubbles out its little life in the water pan; so much was to be expected. To-day you count them, and two more are gone, vanished mysteriously, not a toe-claw left to give a sign. You mutter — *rats.*

At night you take thought for your chickens. The wise old bird, bless her, knows how the insidious foe took advantage of her growing brood, already so large that her broad wings won't cover all, and stole two of her pets. So she has taken them all upon a low perch. With many pe-e-eeps, and dubious craning up of necks, and heads askew, now this way, now that, they have all gone up. There they are, old hen in the middle, as many as can, nestled under her wings, and the rest close up on either side, the prettiest dozen of chickens in the neighborhood. At all events they are safe now; no rat can reach them there.

But in the morning there is a strange subdued quiet about the old bird, which you don't at first understand. She seems bewildered, daft; she clucks once or twice, one foot up, hesitating to step, and then she takes a step; she gets but faint response. You call her, and she sidles up with the two that remain, sadly. There is all that are left of that sitting of particularly fine eggs that Mrs. June, good soul, gave you — you know you can get no more, for her hens are all busy raising chickens — and all there is to show for the old hen's time, worth something, in spite of the proverb, for there is not time for her to sit again, and bring up another brood, before the sharp frosts of autumn. Now don't you wonder what rats were made for?

Rats also make havoc with young rabbits. They creep into the horse's manger, bite his nose, and eat his oats. They are said to nibble the hoofs of the horse, and while the dogs are asleep, to gnaw the cushions at the soles of their feet. In the meat shop, the larder, the pantry, they always choose the best, but when there is

little choice, they eat whatever they can find. Here we learn their use.

In large cities the sewers are laden with vast quantities of material which by its decay would produce noxious vapors, and cause disease. The rats are a grand army of scavengers that devour this offal, and so ward off sickness. The flies, which annoy housekeepers so much, serve a like purpose above ground. Hence the significance of the statement, that in sickly seasons flies are scarce — they have not done their work, and the impure air breeds fever. The spiders, really the housewife's friends and active allies, eat the flies; one nuisance mitigates another.

Mosquitoes, during that part of their life which is spent in the water, consume that which would make the water foul. The dragon-flies eat the mosquitoes, the birds pick up the dragon-flies, and thus the links of nature's intricate, but perfect chain, are woven together.

In spite of his foul feeding, the rat is very cleanly in his habits. He always washes after eating, and takes great care in smoothing and

cleaning his fur. The skin of the black rat bears some value with the furriers; the dressed skins of brown rats are excellent for thumbs of kid gloves; their fur is used for making hats.

BIRDS.

THE FAIRY MARTIN. *Hirundo ariel.*

About Swallows.

Branch — *Vertebrata.* — Having a back bone.

Class — *Aves.* — Birds.

Order — *Insessores.* — Perchers.

Tribe — *Fissirostres.* — Having bills deeply cleft.

Family — *Hirundinidæ.* — Swallow-like.

HEN Summer comes the Swallows come. In far off southern lands they have escaped the cold of our dreary winter months, and have found, while wandering, an ever present spring time. Now, whole flocks are sweeping about us, darting through the air with a swift flight which almost eludes our sight. With most of the small birds, the Swallows migrate, going to

warm climates in the autumn, and returning to cooler countries in the spring. A few may creep into hollow trees, and pass the winter in a torpid condition, like frogs and bears. At one time it was supposed that they found winter quarters in the water, at the bottom of streams and ponds. People imagined this because they did not see the Swallows on their journey, like the pigeons and geese. But if we remember that their usual rate of flying is a mile in a minute, or more than twice the ordinary speed of railway trains, and that, in the day time, they are almost always on the wing, we see that these little creatures may pass in a few days even from the arctic regions to the torrid zone.

"Yet," says Wilson, "it is forced, when winter approaches, to descend to the bottom of rivers, lakes and mill-ponds, to bury itself in the mud, with eels and snapping-turtles, or to creep ingloriously into a cavern, or a rat-hole, or a hollow tree, there to doze with snakes, toads, and other reptiles, until the return of spring! The geese, the ducks, the cat-birds, and even

the wren, which creeps about our out-houses in summer like a mouse, are acknowledged to be migratory, and to pass to southern regions at the approach of winter; the Swallow alone, on whom Heaven has bestowed superior powers of wing, must sink in torpidity to the bottom of rivers, or doze all winter in the caverns of the earth!"

The habits of the Swallows are, perhaps, more easily observed and more generally known than those of almost any other birds. The air is, indeed, their home. They eat, drink, and even feed their young, while on the wing. The beak is very short, broad at the base, much flattened, and deeply cleft, forming a large scoop-like mouth, with which they gather up insects as they fly. They are fond of skimming along within a few inches of the smooth surface of water, sipping and flying. Their feet are short and weak, but their wings, when compared with the size and weight of their bodies, are remarkably large and strong. Their nests are usually made of mud, strengthened with twigs, hair,

and the like, and they are fond of building about dwellings and barns, probably for greater safety from birds of prey.

The Swallows all feed upon insects, and take their food in the air. At times they fly at a great height, so that they seem like tiny dots upon the sky; at other times they sweep over the ground, or near the water, chasing the gnats which come up in myriads from the surface.

The largest of this family is the Australian Needle-tailed Swallow, or Swift, *Acanthylis caudacuta*. It has the name Needle-tail on account of its curious tail-feathers. These are short and even, and have no web near the end, so that they form a row of short, sharp points.

Mr. Gould, in his "Birds of Australia," says: "So exclusively is this bird a tenant of the air, that I never, in any instance, saw it perch, and but rarely sufficiently near the earth to admit of a successful shot; it is only late in the evening, and during lowery weather, that such an object can be accomplished. With the exception of the crane, it is certainly the most lofty, as

well as the most vigorous flier of the Australian birds. I have frequently observed, in the middle of the hottest days, while lying prostrate on the ground, with my eyes directed upwards, the cloudless blue sky peopled at an immense height by hundreds of these birds, performing extensive curves, and sweeping flights, doubtless attracted thither by the insects that soar aloft during serene weather. Hence few birds are more difficult to obtain, particularly on the continent of Australia, where droughts are so prevalent; on the contrary, the flocks that visit the moister climate of Van Dieman's Land, where they must seek their food nearer the earth, are often greatly diminished by the gun.

"We may naturally conclude that both rocks and holes in the larger trees are selected for their nests, as well as for a resting-place during the night. Before retiring to roost, which it does immediately after the sun goes down, the Spine-tailed Swallows may be seen, singly or in pairs, sweeping up the gullies, or flying with immense rapidity just above the tops of the trees, their

never-tiring wings enabling them to perform their evolutions in the capture of insects, and of sustaining them in the air during the entire day without cessation."

The general color of this bird is olive brown, washed with a dark green tinge upon the back of the head, the wings, and the tail. Before the eyes there is a dark velvet patch, and most of the under part of the body is white. Its length, when its wings are closed, is twenty-eight inches, and twenty inches to the end of the tail.

The White-bellied, or Alpine Swift, *Cypselus melba*, is about eight inches long, and spreads its wings about eighteen inches, yet its weight is barely *one ounce*. Its general color is sooty black, its chin and throat being white. It builds its nest in crevices of high cliffs or buildings, and makes it of straw, hay, moss and other things, firmly cemented together with a kind of saliva. It lays four or five long, white eggs.

Another, the Common Swift, of England, *Cypselus apus*, is called, by the English boys, "Jacky Screamer." This bird usually makes

its home in holes in rocks, or in hollow trees, or in the thatched roofs of houses. "Formerly," says Wood, "when all the less pretending houses were covered with thatch, the Swifts had their nests in every roof, and the 'Jacky Screamers' used to hunt for flies in the streets, and boldly carry their prey to their young. The houses were so low that a man could touch the eaves by standing in a chair, and the habits of the birds were easily watched. Their nests were frequently robbed, but the birds seemed to care little for the bereavement, and quietly laid another couple of eggs. I seldom found more than three eggs in a nest."

The structure of its feet enables the Swift to scramble through the tunnel leading to its nest with great speed. It is most interesting to see it wheel about in the air, utter its sharp cry, answered by a little complacent chirrup from its mate within the nest, then dart into its hole as if shot from a bow, closing its wings as it enters the tunnel, and then scramble away with a quick and sure gait.

The Barn Swallow, of America, *Hirawdo horreorum*, is about seven inches long, the wings five inches; the tail is very much forked. Its color is steel-blue above, and reddish-brown beneath. It loves to build in barns, and the farmers often leave holes in the gables for its entrance. Its nest is made in the form of an inverted cone, with a slice cut off on the side by which it sticks to the rafters. At the top it has a kind of shelf, on which the bird sits occasionally. The shell is made of mud mixed with fine hay, as plasterers mix hair with mortar to make it less brittle; the mud is about an inch thick, placed in regular layers. The inside is filled with fine hay, well stuffed in, and covered with a handful of downy feathers. These birds are very social, and often twenty or thirty nests may be seen so close together that a finger could hardly be laid between them. The farmers have a superstition that ill luck will come to a person who kills one of them; and some think that a building which they take possession of will not be struck by lightning.

At all events, their sprightly warble makes even the rudest barn cheerful and homelike.

The American Chimney Swallow, *Acanthylis pelasgia*, is peculiar to this continent, and is quite different from its English name-sake, *Hirundo rustica*. These Swallows reach the Northern States about the middle of May or the first of June, and dwell wherever there are chimneys convenient for their purpose. Since they always choose a chimney for their home, some may ask what they did before white men built chimneys. In those sections of the country which are unsettled, they occupy tall, hollow trees, called Swallow-trees; but wherever there are settlements, the Swallows forsake the woods They are more secure from birds of prey, they have better room for their sweeping flights, and they find a better surface, to which the material of their nests may adhere.

Their nests are made of very small twigs, fastened together with a strong adhesive glue, secreted by two glands on each side of the head, and mingled with the saliva. They are small

and shallow, and adhere by one side of the wall; they want the soft lining which is found within the nests of many other birds. The eggs are generally four, and two broods are often reared in a season. The noise which the old birds make in passing up and down the flues, has some resemblance to distant thunder, or in the silence of the night brings to persons with weak nerves suggestions of robbers. During heavy and long continued rains the glue sometimes fails to hold the nest, and, with its contents, it drops to the bottom of the chimney. If eggs, they are, of course, destroyed; the young birds, if there are any, often scramble up the sides of the flue, holding on by their toes, and are fed in this position for some time.

This Swallow is distinguished, when in the air, by its long wings, short body, the quick vibration of its wings, and its wide, unexpected, diving flight, shooting swiftly in various directions with no apparent motion of its wings, and uttering quickly its hurried *tsip, tsip, tsip, tsee, tsee.* It is very gay in damp weather, at the

approach of rain, and after a passing shower; it is out early in the morning and late at night. Early in September these birds assemble in convention, about some lofty tree or tall spire, wheeling about and chirping as busily — and as much to the purpose — as a party of politicians — perhaps nominating a mayor or governor — and then they take their flight for a warmer clime.

A very interesting member of this family is the Sand Martin, or Bank Swallow, *Cotile riparia.* In size, this bird is one of the smallest, being less than five inches long. Its color is soft brown, with black wing and tail feathers; the under surface is white. One would hardly expect to find the home of so graceful and delicate a bird in the ground, but with its sharp bill it manages to dig a burrow, where much larger four-footed creatures would fail. It makes its hole in any sandy soil, but most loves a light sandstone, because its work keeps best shape in that. The depth of the burrow varies from two to five feet, but the end is usually

beyond the reach of the arm. Generally it is quite straight; should a root or stone be in the way it winds about it, or, if the obstacle is too large, the bird leaves the hole and begins again. In all cases it slopes gently upward, so that any water which comes in may easily run out.

The bird sets at work in a very workmanlike way. It first taps several places with its beak, until it finds one which will suit. Then it turns on its legs as a pivot, working all round a centre, and chipping out a very regular circle, and so pushes on, clinging equally well to roof or sides, and going back and forth with the greatest ease. The nest at the end is globular, and lined with a few bits of soft substance—hay, moss or feathers. The eggs are very small and delicate. When new laid they are pink, but afterwards become white.

The voice of the Sand Martin is a weak twitter; when the birds are plenty their chirping may be heard at quite a distance. When it is angry or frightened it pours forth a harsh scream. It does not tolerate other birds in the

vicinity of its home, and a mob of Sand Martins will even drive away a hawk. They usually make their burrows in the bank of a stream or lake, where they may find a supply of food in the insects which swarm about the water, and their numbers often suggest the countless swarms about an immense bee-hive.

The Purple Martin, *Progne purpurea*, is found throughout America, from the Gulf of Mexico to Hudson's Bay. It loves to build about human habitations; even the Indians respect it, and contrive homes for it by hanging gourds about their wigwams. The more civilized farmer provides neat boxes which he fastens on the top of the house, or on tall poles. Sometimes the Martins presume in their familiarity and drive the pigeons out of their houses. But, wherever they find a home, they are very constant in their attachment, making but one nest, and returning to it year after year.

Where a pair of Martins have established themselves they will allow no other larger bird to dwell. A hawk, a crow, or a jay,

which presumes to intrude, is pounced upon without mercy, and so tormented that he is glad to escape. Even the eagle is no exception; and it is a curious fact that though the Martin will fly at the king-bird, it will join with the king-bird to chase away the eagle. Its flight is so rapid that it has nothing to fear from the talons of the larger bird, and so it attacks him in safety. The color of the bird is a rich, deep, very glossy purple, the wings and tail being black. It lays from four to six eggs, and brings out two broods in a year, the male and female each sitting on the eggs in turn.

A beautiful species, found in Australia, called the Fairy Martin, *Hirundo ariel*, is one of the most ingenious of the bird-builders. Its nest is shaped like an oil flask, and made of mud and clay, which the bird kneads thoroughly with its beak. Several birds build at one nest, one staying inside and shaping the mortar which the others bring to him. In pleasant days the birds work only in the morning and evening, because the mud dries before they can mould it prop-

erly, but in rainy weather they keep at work all day. The necks of these bottles are from seven to ten inches long, and the bulb or nest is from four to seven inches in diameter. The outside is rough, like the nests of the common Swallow, but the inside is beautifully smooth. Sometimes these mud-flasks are fastened to a house, in rows under the eaves; sometimes they are placed upon the steep face of a cliff, and then hundreds may be seen close together, without the slightest order, the necks sticking out in all directions. They are always near water, but not near the sea.

An American Swallow builds a nest quite like that of the Fairy Martin. This is called the Rufous, or Red-Necked Swallow, *Hirundo fulva;* it is sometimes called the Republican Swallow, because it gathers in large companies. The nests have a wider and shorter neck than those of the Fairy Martin. Towards night these birds gather in large flocks, calling to each other, so that at a distance their flight seems like a moving cloud. Suddenly this

among all the odd and curious nests in which to build the birds of many lands make their nests, this most surprises them who see it for the first time. Europeans think the nests rather insipid food, and of no great value. The trade in them is very large, amounting to more than fifty thousand pounds a year, worth nearly a million of dollars.

Although we have described by no means all the varieties of this very interesting family, the most important of them have been mentioned. We are not attracted to them by their plumage, although when we examine that we find their colors exceedingly rich and lustrous. Their song has little variety or harmony. We do admire their graceful forms, and their swift and airy motions. We love these birds for their activity in their own way of doing good; for their regular and constant return to old homes and familiar haunts; and for the confiding trust with which they love to build and live about our dwellings.

THE BOB-O-LINK. *Dolichonyx oryzivorus.*

About Blackbirds.

VERTEBRATA. — AVES.

ORDER — *Insessores.* — Perchers.

TRIBE — *Conirostres.* — Having cone-shaped bills.

FAMILY — *Icteridæ.* — From Latin, *icterus.*

WIDE-AWAKE, noisy, impudent fellow is the Blackbird. He comes quite early in the Spring, and as you pass some spreading tree in the pasture, or skirt along the willow copse by the meadow, you see that he has brought with him his whole family, and all his acquaintances. The brush is black with them, and they all seem in earnest debate, rising, and perching, and chattering

incessantly; and then, all on a sudden, away flies the whole flock. You knew they were countless, but, as they fly, it seems as if the largest half of them had been in ambush, or had sprung out of the ground.

Like the "crane and the swallow," the Blackbirds "know the time of their coming." Before they leave the southern states they gather in numbers which are almost incredible. On one occasion, in the month of January, Wilson says he met in Virginia, on the Roanoke River, a prodigious army of these birds. They rose from the surrounding fields with a noise like thunder, and, descending on the length of road before him, covered it and the fences completely with black; when they again arose, and, after a few circles, descended on the skirts of the high-timbered woods, at that time destitute of leaves, they produced a very singular and striking effect; all the trees for a considerable distance, from the tops to the lowest branches, seemed as if hung in mourning; the notes and screaming of the birds meanwhile resem-

bling the distant sound of a great cataract, but in more musical cadence, swelling and dying away in the air, according to the fluctuation of the breeze.

This bird is known among us as the common Crow Blackbird, and is often called by naturalists the Purple Grakle, *Quiscalus versicolor*. At a distance his plumage appears jet black, but on a nearer view it is found to be a very dark purplish green, with glossy reflections of steel blue, dark velvet, and metallic copper. The male is about twelve inches long, and eighteen in expanse of wing. The female is somewhat smaller, but similar in color.

The Blackbird feeds either upon seeds or insects. In the Spring he frequents swamps and meadows, and follows the furrows of the plow, even scratching in the ground for grubs and other insects which would do the farmer much harm. But when the tiny green shoots of the corn peep through the soil, he knows very well that there are nice soft grains beneath, and so, after his own fashion, he takes his pay

for the grubs he has slain. When the corn is in the milk the Blackbirds descend again upon the fields like a blackening, sweeping tempest. They strip off the husk as dexterously as if by the hand of man, and having laid bare the corn, leave little but the cobs. For these reasons it is hardly strange that the farmers think the Blackbird a pest, and make him an outlaw, in peril from the pelting of every idle, roving boy.

Most small birds are afraid of the larger kinds, and if a hawk or eagle show himself, they either hide themselves or try to drive him away, relying upon force of numbers or swiftness of wing. The Blackbird, however, is a curious exception, for it actually builds its nest in company with the Osprey, or Fish-hawk. The nest of the Osprey is a large mass of sticks, grass, leaves and similar materials. The foundation is made of sticks as large as broom-handles, and two or three feet long; on these similar sticks are piled, until the heap is some four or five feet high. These are interwoven with corn-stalks, straw, sea-weed, or leaves, the whole

mass being enough to load a cart. The birds occupy the nest year after year, even until the tree decays and falls to the ground.

The Blackbirds build their nests in the spaces between the sticks which form the nest of the Osprey. There, like vassals round the castle of their chief, they live and rear their young. Wilson found no less than four such nests about the nest of one Osprey, and a fifth on the nearest branch of a neighboring tree. Of course all the Blackbirds can not build in Ospreys' nests. Most occupy tall trees, generally in companies of fifteen or twenty. The nests are made of mud, roots and grass, and are lined with fine dry grass and horse-hair; they are about four inches deep, and contain five or six dull green eggs, spotted with olive.

The Red-winged Blackbird, *Agelaius phœniceus*, is found throughout the United States; it passes the winter in the south, and returns north early in the spring. The Red-wings fly in flocks, which rival in numbers, and in rapid and erratic motion, those of the common Black-

bird; indeed, the two birds often migrate together. On the wing they enliven their way with mutual chatter, and as genial Spring comes with them, we are glad to see them, although we know they will pull up corn. Their music is a compound of liquid, jingling notes, mingled with the jarring sounds of filing saws and creaking sign-boards, the whole uttered in downright earnest, and forming a curious concert of harmony and discord.

"Assembled in their native marshes," says Nuttall, "the male, perched on the summit of some bush surrounded by water, in company with his mates, now sings out, at short intervals, his gutteral *kong-quer-ree*, sharply calls *t'tsheah*, or, when disturbed, plaintively utters *t'tshay;* to which his companions, not insensible to these odd attentions, now and then return a gratulatory cackle, or reiterated chirp, like that of the native meadow-lark. As a pleasant and novel, though not unusual accompaniment, perhaps the great bull-frog elevates his green head and brassy eyes from the stagnant pool, and

calls out in loud and echoing bellow, *'w'rroo*, *'warroo*, *'worrorroo*, *'boarroo*, which is again answered, or, as it were, merely varied, by the creaking or cackling noise of his feathered neighbors."

The Red-wing usually builds its nest in some swamp, or marsh, abounding with alders. In these, and sometimes in a detached bush, in a tussock of rank grass in the meadow, the nest is curiously wrought with the long dry leaves of meadow grasses, and the slender blades of the flags, carried round the stalks of the leaves for support, and carefully interwoven. The meshes of this basket are filled with rotten wood, roots of grass, peat, and mud, making, when dry, a substantial shell, which is lined with fine dry stalks and rushes. The eggs are five in number, pale blue, spotted near the large end with light purple and dark brown. The male bird is about nine inches long. His color is deep glossy black, with bright scarlet over the shoulders. Most of the plumage of the female is black, the feathers being edged

with reddish, or yellowish brown, so that she is curiously mottled. The young are marked like the female, and do not put on the entire gay livery of the male until several years old.

Because the Red-wing is so fond of corn he is considered an intolerable nuisance, and is killed by every possible means. But there is another side to this story. What can the multitudes of these birds eat, after the corn is too large to pull, and before the ears are grown? During all the spring and summer they feed on little else but insects, choosing especially those which devour the young leaves of growing crops. Whether a grub be buried in the earth, eating away the root of a plant, or concealed among the the thick foliage, which it destroys, or boring a passage in the trunk of a tree, the Red-wing finds it, and eats it, or takes it to his young. Wilson examined the crops of many of these birds, and calculated that, upon the average, each bird destroyed fifty grubs daily, and, probably, twice that number. The number of insects, then, which these birds will eat

in a single season, is beyond conception, and they ought to be cherished, rather than destroyed. In all the eastern states, grain, fruit, and, in fact, every kind of crop which farmers raise, suffer immense injury, and are often utterly ruined by insects, which the birds would take care of if the farmers were wise enough to let them.

The Cow Blackbird, or Cow Troopial, *Molothrus pecoris*, enters the northern states about the first of April; about the middle of July it disappears again and is not seen until September, when it re-appears for a short stay before it goes south. It feeds upon worms and grubs, following the plow with the Red-wings and Crow Blackbirds, and is often busy about cattle, picking up the insects which they happen to disturb.

Unlike most other birds, the Cow-bird never pairs, and makes no nest; it lays its eggs in the nests of other birds and leaves them to their fate. The strangest part of this is, that the poor bird upon whose charity the egg has

been thrust, takes charge of it, and brings up the young bird hatched from it in preference to her own.

The following anecdote, by Doctor Potter, shows that the Cow-bird creeps slyly into the nests of other birds, and that even the most peaceable will sometimes resent the injury:

"A blue-bird had built for three summers in the hollow of a mulberry tree near my dwelling. One day, when the nest was nearly done, a Cow-bird perched upon a stake fence near, her eyes apparently fixed upon the spot, while the builder was busy upon her nest. The moment she left it, the intruder dashed into it, and in five minutes returned and flew away to her mates with noisy delight, which she expressed by her actions and tones. The blue-bird soon returned and entered the nest, but at once fluttered back with much hesitation and perched upon the highest branch of the tree, uttering a rapidly repeated note of complaint and anger, which soon brought her mate. They entered the nest together, and returned a sec-

ond time, uttering a continual complaint for ten or fifteen minutes. The mate then dashed away as if in search of the offender, and fell upon a cat-bird, which he chastised severely, and then attacked an innocent sparrow that was chirping its ditty in a beech-tree. After all this, the Cow-bird was found to have laid another egg next day." The observation was not continued, for a snake found the nest and destroyed its contents.

The egg is usually laid in the nest of some smaller bird, as the red-eyed flycatcher, the blue-bird, the chipping sparrow, or the golden crowned thrush. The egg of the stranger is hatched first. The great size of the intruder soon stifles the rightful heirs, and the parent bird carries away its own dead young to make room for the foundling; they are not found under the nest where they would have dropped if the little Cow-bird had shouldered them out. As soon as he is fledged the graceless little fellow deserts his foster parents and skulks about the woods, till, after a time, he instinctively

... same manner, proving the

... seven inches long. The
... is light chocolate brown;
...

... deservie member of
... the Provinces. *Dol-*
... southern states he is
... middle states, the
... through the
... Bobolink or Bob-
... his annual journey from
... long, last
... supplies, until May, or
... taking possession of
... Massachusetts or the Missis-
... southern states.

... part of the year.
... Bobolink, is seen;
... he sings,
... with quivering wings,
... despair,
... laughter, thro' the air."

"O rapture! sunshine winged and voiced,
Pipe blown through by the warm wild breath of the West,
Shepherding his soft droves of fleecy cloud,
Gladness of woods, skies, waters, all in one,
The Bob-o-link has come, and, like the soul
Of the sweet season vocal in a bird,
Gurgles in ecstasy we know not what
Save *June! Dear June! Now God be praised for June!*"

— LOWELL.

The male has put on his wedding suit, black, trimmed about the head, shoulders and back with white. He is in excellent spirits, and pours forth incessant strains of lively music from every bush and fence. As he flits from tree to tree, by short fluttering sweeps, hovering over the field, he utters a jingling medley of sounds, rapid, constant and confused, which seem hardly possible from the throat of a single bird. Almost every listener translates his song variously. All know his opening strain, *bob 'lee*, *bob 'link*, *bob 'linkee*, *bob 'link*, but every school-boy hears his own mischievous pranks described in the jargon that follows, and every blushing girl knows he is the "little

bird that tells." But summer rolls on, and Robert of Lincoln finds a family upon his hands. He becomes more sedate. The gay white slashing of his coat is exchanged for the brownish yellow livery of his mate, and instead of his joyous spring-time song, he can only whistle *bob 'lee,—bob 'lee*, which soon becomes only *'weet 'weet, b'leet, b'leet.* He is about six inches long.

Madam Bob-o-link hides her nest very carefully and successfully in the thick grass. A nest which is before the writer just fills a paper collar-box, four inches in diameter, and two inches deep. It is merely a mass of short stalks and leaves of dried grass, hollowed out at the top. The six tiny eggs in it are about three-fourths of an inch long, quite pointed at the smaller end, pearly-white, and spattered with brown spots, which are largest and thickest at the broad end of the egg.

Like the other birds of this family, the Bob-o-links feed mostly upon insects, but, at harvest, show a decided taste for grain and corn. About

the middle of August they begin to migrate southwards. They are found in large flocks along the reedy shores of the Delaware, fattening upon the fields of wild rice, and many of them are taken for the markets of Philadelphia and New York. As the season advances they go on, and passing through the rice swamps of the Carolinas, become the Butter-birds of the West Indies.

Who taught these birds of the air to take their annual journey? How do they know the time of their flight? Who shows them the route from their winter homes in the sunny south to their summer mansions in the meadows and forests of the north? Who taught them to build their nests? Who tuned their varied song? These questions rise concerning all our summer birds, and though we can not tell how they learn to trace their way from one old haunt to another, we know that the same Being who painted their beautiful plumage, and tuned their melodious song, gave them an instinctive knowledge which forces them to do that which

is fitting at the right time and in the right way. Having no choice, no will, no reason, they can not go wrong, but work out their results according to the plan which their Creator designed.

THE O'LINCON FAMILY.

A flock of merry singing-birds were sporting in the grove;
Some were warbling cheerily, and some were making love;
There were Bobolincon, Wadolincon, Winterseeble, Conqueedle,—
A livelier set were never led by tabor, pipe, or fiddle,
Crying, "Phew, shew, Wadolincon, see, see, Bobolincon,
Down among the tickletops, hiding in the buttercups!
I know the saucy chap, I see his shining cap
Bobbing in the clover there,—see, see, see!"

Up flies Bobolincon, perching on an apple tree,
Startled by his rival's song, quickened by his raillery.
Soon he spies the rogue afloat, curvetting in the air,
And merrily he turns about, and warns him to beware!
"'Tis you that would a-wooing go, down among the rushes O!
But wait a week, till flowers are cheery,—wait a week, and, ere you marry,

Be sure of a house wherein to tarry!
Wadolink, Whiskodink, Tom Denny, wait, wait, wait!"

Every one's a funny fellow; every one's a little mellow;
Follow, follow, follow, follow, o'er the hill, and in the hollow!
Merrily, merrily, there they hie; now they rise and now they fly;
They cross and turn, and in and out, and down in the middle, and wheel about,—
With a "Whew, shew, Wadolincon, listen to me, Bobolincon!
Happy's the wooing that's speedily doing, that's speedily doing,
That's merry and over with the bloom of the clover!
Bobolincon, Wadolincon, Winterseeble, follow, follow me."

Oh! what a happy life they lead, over the hill and in the mead!
How they sing, and how they play! See, they fly away, away!
Now they gambol over the clearing,—off again, and then appearing!
Poised aloft on quivering wing, now they soar, and now they sing:—
"We must all be merry and moving; we must all be happy and loving;
For when the midsummer has come, and the grain has ripened its ear,

The haymakers scatter our young, and we mourn for the rest of the year;
Then Bobolincon, Wadolincon, Winterseeble, haste, haste away!

— *Atlantic Monthly.*

THE DOWNY WOODPECKER. *Picus pubescens.*

About Woodpeckers.

VERTEBRATA. — AVES.

ORDER — *Scansores.* — Climbers.

FAMILY — *Picidæ.* — From *picus*, a Woodpecker.

AT-TAT-TAT. *Rat-tat-tat-tat.* Do you hear him? There he is, on the dead top of that old oak tree. Here he comes, with his curving sweep, and lights on the trunk of this rock-maple. Now he sees you, and puts the tree between you and him, for safety. If you go round to see him, he goes round too, just peeping about the side, to keep you in one eye, while with the other he peers into every

cranny in the bark, into every old knot-hole or decayed spot, for any worm or grub which may have hidden itself away. Back he goes, and is hammering away again at that old tree, scooping out a nest for himself and his family. A brisk, busy, wide-awake bird, this Woodpecker, and one that will amuse you if you watch him closely.

His feet are not like those of most birds. The toes point, two before and two behind, and so, like the two hooks which grasp the ends of a barrel and lift it in the air, these hooks hold to the bark of the tree and allow the bird to run up or down, or hold on and hammer away at his leisure. His tail is armed with stiff pointed feathers, and while he clings with his claws this tail serves as a brace, the stiff quills resting against the bark and holding him up. His beak is hard, and sharp pointed. His tongue is upon the end of a long bone which divides at the throat, passes on each side of the neck and then unites again and goes on over the back of the head and the forehead, almost to

the base of the beak. By this means he can thrust out his tongue an inch or two beyond his beak, and spear an insect on its barbed point, as a fisherman spears a fish. Such as are too small to be harpooned thus, are caught by a slimy saliva which moistens the tongue.

The Woodpecker does not build a nest; he burrows. With his ivory beak he bores a hole in the body of a tree, usually finding some spot where the wood is decayed, and then, when he has reached the heart of the tree, he continues the burrow downwards, enlarging it into a convenient pocket. Here the eggs are laid, on no other bed than the few chips which the bird has not taken the trouble to remove. Sometimes the nest is entered by the wren, who allows the Woodpeckers to go on until he thinks the hole large enough for his purpose, and then drives them out and takes possession. At other times the black snake glides up the trunk, enters the burrow of the bird, eats up the eggs or young, and makes itself at home.

"The eager school-boy," says Wilson,

"after risking his neck to reach the Woodpecker's hole, at the triumphant moment when he thinks the nestlings his own, and strips his arm, launching it into the cavity, and grasping what he conceives to be the callow young, starts with horror at the sight of a hideous snake, and almost drops from his giddy pinnacle, retreating down the tree with terror and precipitation. One adventure of this kind was attended with serious consequences, where both snake and boy fell to the ground, and a broken thigh cured the adventurer of his ambition for robbing Woodpecker's nests." The nest of the Woodpecker, unlike those of most other birds, is exceedingly filthy, the smell being almost beyond human endurance.

Some twenty-five species of Woodpeckers are found in America, and others are known in all quarters of the globe. Of the American varieties, one of the best known is the little Downy Woodpecker, *Picus pubescens*. This bird is about six inches long. His head is velvety

black on the crown, and scarlet on the back, with a white streak over the eye. The back is black, marked with a stripe of downy white feathers. The wings and tail are black, spotted with white. The female has no scarlet on the head.

Because this bird digs holes in the bark of fruit trees, people wrongly suppose that he injures the tree, and therefore kill him.

Wilson says: "In the fall he is particularly fond of boring the apple trees for insects, digging a circular hole through the bark just sufficient to admit his bill; after that a second, third, etc., in pretty regular circles round the body of the tree. These circles of holes are often not more than an inch apart, and sometimes so close together that I have covered eight or ten of them with a dollar. From near the surface of the ground to the first fork, and sometimes far beyond it, the whole bark of many apple trees is perforated in this manner, so as to appear as if made by successive discharges of buck-shot; and our little Wood-

pecker is chiefly guilty of this supposed mischief. I say supposed, for they are not only harmless, but really good for the health and fertility of the tree. In more than fifty orchards which I have myself examined, those trees which were marked by the Woodpecker were uniformly the most thriving and productive. Many were upwards of sixty years old, their trunks completely covered with holes, while the broad branches were loaded with fruit. Of decayed trees, more than three-fourths were not touched by the Woodpecker."

The largest American bird of this family, and the handsomest, is the Ivory-billed Woodpecker, *Campephilus principalis*. This bird is about twenty-two inches long. His general color is black, glossed with green. A white stripe runs down the sides of his neck and along his back, tipping the feathers of the wings. The back of his head is adorned with a beautiful scarlet crest. His beak is long, ivory white, and nearly an inch broad at the base.

When he has been at work upon a tree, he leaves a heap of bark and chips, by which he may be known as an active workman. Large strips of bark are torn off, and the wood is pecked with holes as if a steel tool had been used. Yet the bird only attacks the decayed wood, to reach the grubs and worms within, leaving the sound wood untouched.

Like the others of the family, this bird digs his nest in the substance of the tree. The opening is carefully placed under some branch, that the driving rain may not enter; the hole is bored inwards a few inches, and then turns downward, extending from ten inches to nearly three feet. The diameter of the nest is about seven inches, but the opening is only large enough to admit the bird.

His note, when caught or wounded, resembles the cry of a young child. Mr. Wilson caught one near Wilmington, and took it to town in the box of his carriage. The cries of the bird attracted much attention, and the landlord at the hotel looked rather surprised

when Mr. Wilson asked for care for himself and his baby. The bird was locked up in a room, and Mr. W. went to look after his horse. When he returned he found the Ivory-bill mounted on the side of the window; he had broken off the plaster from a space about fifteen inches square, had cut a hole through the lath, and was fast working his way into the outer boarding of the house. In an hour longer he would have escaped. A string was tied to his leg and he was fastened to the table. While his captor was gone to find him some food, he attacked the mahogany table, and completely ruined it. He would not take food, and in a few days died.

The Indians honor the bold and fiery disposition of this bird, and carry its head and beak as one of their charms or "medicines." It is never found in cultivated tracts, but dwells in the lonely forest, among the largest trees, in the dim recesses of the cypress swamps.

Another well known species is the Red-headed Woodpecker, *Melanerpes erythrocephalus*.

This is one of the commonest birds, bold and not afraid of the society of man. He is as active in boring for insects as any other, while it must be confessed that he does some mischief. Wherever a tree, whether of cherry, peach, or apple, bears particularly good fruit, he is at hand to taste the earliest and the ripest, and if caught in the act, he thrusts his bill into the best specimen at hand and flies away with it, uttering a loud exulting scream. He likes to find his way through the husks into the rich, milky ears of Indian corn. Towards autumn he comes about the farmhouses and barns, and one often hears his lively tattoo on the shingles.

On account of his pranks in the garden he is much disliked, and a bounty is sometimes offered for his head. But, like other birds which are in bad odor, it may be a grave question whether, after all, he does not do more good than harm — whether he takes more than toll for the fruit he has helped to save. He is a gay fellow, and his bright colors contrast finely

with the green foliage, as he sweeps from tree to tree.

The head and neck are scarlet, and the upper parts of the body black, with a steel-blue gloss; a broad band across the wings and the lower half of the back is white. As the bird flies he looks as if he wore a white gown, with a black mantle over his shoulders, and a scarlet hood. He is about nine inches long. His note is shrill, and not unlike the cry of a tree-frog.

The Golden-winged Woodpecker, or Yellow-hammer, *Colaptes auratus*. This bird comes on the first bright days of Spring. He is a brisk creature, skipping about the tree trunks with great activity, running up or down, or spirally, either at play or in search of food. He may be tamed, but must be kept in a strong wire cage, without any wood, or he will, like the Ivory-bill, make a speedy escape. Even then his incessant hammering, begun at early dawn, will make too much racket for ears which would enjoy ordinary quiet.

He is about twelve inches long. His general

color is olive brown, with bands of black, and a black crescent on the breast; the lower parts are yellowish white, with black spots; the under surface of the wings and tail gamboge yellow. He has a crescent of red on the back of the head.

The most common English Woodpecker is the Green Woodpecker, *Gecinus viridis.* The boys call him Rain-bird, Wood-spite, Hew-hole, and Wood-wall.

Another is known as the Great Spotted Woodpecker, *Picus major.* Their habits are too nearly like those already mentioned to require description.

THE CROWNED PIGEON. *Gaura coronata.*

About Doves.

VERTEBRATA. — AVES.

ORDER — *Columbæ*. — Latin, *Columba*, a Dove.

NO bird is more generally beloved than the Dove. The domestic Doves which throng about our dwellings attract us by their graceful forms, their delicate plumage, and their soft, liquid notes. Their wild relatives are loved as well for all these qualities, and for their gentle and constant affection for each other. The youngest child stretches out his hand in delight for the cooing dove. The maiden loves to feel it nestle in her bosom, a willing pris-

oner — to smooth its snowy plumage, and allay its rising fear. The mother finds a type of her own maternal fondness in the care of the Dove for her young, and the sorrowing mourner hears her own woes re-echoed in the sad moan of the Turtle-dove, bewailing her murdered mate. All through the Winter, when other birds have flown to sunnier lands, the glancing wings and rushing sweep of the flying Doves enliven the chilly scene, while at all seasons their presence, coming and going, gentle, harmless, familiar, makes the day, and the home, more cheery and sunshiny.

With few exceptions their flight is swift, and they can continue it for a long distance. The family is found in nearly all parts of the world, but is most abundant in warm climates. The colors of those best known to us are soft and delicate, rather than deep or brilliant, though some parts, especially the feathers about the neck, glow with changeful beauty. In warmer lands their plumage is varied with the most beautiful colors, and elegant forms.

All the birds of this order have a double crop. In this receptacle the food is mingled with a milky juice, until the mass becomes soft and pulpy; a portion of this is raised into the beak and fed to the young.

The first species which we will mention is the Rock Dove, *Columba livia.* It has this name because it frequents rocks rather than trees; even the young which escape from the dove-cot, and from broods which for many generations have never known any thing but wooden houses, build in rocky caverns rather than in trees. The general color of the wild Rock Dove is some shade of gray; the neck and throat are varied with changing hues of green and purple; the wings are barred with black.

From the Rock Dove have sprung all the many varieties of domestic Doves. Indeed, these birds can hardly be called tame, or domesticated. For the rocky cave, to which the bird's nature directs him, man substitutes a wooden box, and the Dove takes possession

of it, very much as the martin occupies the box provided for him, and as the chimney swallow builds in a place constructed by man.

The management of the dove-cot has become quite an art, and may be made profitable from the great number of young pigeons which are continually produced. It is said that a dove-house is best in the form of a circular tower. The rows of boxes should be so arranged about the inside that the partitions in one row of boxes may stand over the openings of the range beneath. The tower should be so large that a person standing in the centre can conveniently reach the boxes. A horizontal shelf, covered upon the under side with sheet iron, should be placed below the boxes to prevent rats from climbing up for the eggs or young birds. The boxes should be high enough to allow the bird to stand when feeding its young, and each box should have a platform before it, and be closed in front, with a hole just large enough for the bird to enter. This will prevent other Doves from disturbing the rightful tenants

when sitting. When the young birds are of proper age, those which the keeper wishes to mate should be shut up together, and in a short time they become so attached that only death or removal will divorce them. The Dove hatches a pair of eggs every month. The eggs are laid in three days, and hatched in fifteen more; the female sits by night, and the male during the day. When the young Doves, called squabs, are hatched, they require warmth for about three days, and are fed after this for about ten days, although they are sometimes found in the nest until the next brood is hatched.

Several curious varieties have been reared by pigeon fanciers, some of which are so unlike, that one would hardly recognize them as kindred. The Broad-tailed, or Fan-tailed Shaker, has a large number of feathers in its tail, which it spreads like a turkey, and shakes like a peacock. This pigeon flies awkwardly, and is apt to be overset or carried away by the wind. The Jacobin Pigeon has a frill of raised feathers,

beginning at the back of the head and extending down the sides of the neck, which resembles the hood worn by monks. Its head, wings and tail are always white; the other parts are often reddish brown, or fawn-colored, and sometimes white. The birds which are all white are most prized. A very curious variety, called the Pouter, or Cropper, has a way of puffing out his crop with air, until it is larger than himself. When the crop is inflated the other Doves sometimes strike it with their bills, and pierce a hole through the thin wall, thus causing the poor bird's death. The habit is unnatural and is likely to cause disease, so that the variety is not much esteemed. There are many other kinds, as Nuns, Owls, Barbs, Turbits, Horsemen, etc.

The Carrier Pigeon is also considered a variety of the Common House Dove. All pigeons are very fond of home, and have a wonderful power of finding their way back to their mates, when they have been separated. The remarkable feats of the Carrier Pigeon

have been made famous in prose and verse. In the wars of the ancient Romans, and during the Crusades, these birds were used to carry news from the inhabitants of besieged cities. Sometimes they were caught by the hawks of the besieging army, and the message fell into hands different from those intended. In later times Pigeons carried news of markets, and such items as are now sent by telegraph. In Turkey sentinels were posted in wooden towers at regular distances of thirty or forty miles, and the Pigeons flew from tower to tower. They wore about their necks little boxes of very thin gold, in which the messages were carried. After steamships crossed the ocean, Pigeons took the news from Halifax to Boston; when vessels arrived off Sandy Hook they were announced in New York in the same way.

To train the birds for this service, they are first carried in a bag or basket about half a mile from home, and then let go. This is done several times, and then the distance is increased to two, four, ten or twenty miles, until they

will return from any place. The message is written upon the finest of thin paper, and fastened with a pin to a feather under the wing, or tied with a string to the leg. The birds fly about twenty-five miles an hour. In foggy weather they are often lost; and when the ground is covered with snow they do not find their way easily. When starting, they rise to a great height, hover for a while in an undecided manner, and then, as if they had found the way, dart off like an arrow.

The Turtle Dove has always been regarded as the emblem of tender affection, from its general behavior, and from its gentle soothing note. The sacred writers loved the bird as coming with the Spring: "For the time of the singing of birds is come, and the voice of the Turtle is heard in our land." The American Turtle, or Carolina Pigeon, *Columba Carolinensis*, is generally known throughout the United States. Its flight is quick and strong, and marked by a peculiar whistling of the wings, different from that of the wild pigeon.

This bird is a favorite with all who wander in the forest, and listen to its mournful music. It has four notes; the first is high and seems to prepare for those which follow, three long, deep moanings, which win the sympathy of every hearer. After a few minutes' pause, the same mournful strain is repeated. The song, after all, is not mournful, but is a call of love, similar to those which have made the whole family celebrated.

The nest is rudely constructed of a handful of twigs, covered with fibrous roots, and contains two white eggs. The bird is about twelve inches long; its colors, above, brownish drab; below, pale olive.

Audubon describes a beautiful Dove which lives upon the small islands called Keys, about the coast of Florida. Its cooing is so peculiar that any one asks "what bird is that?" A man, who had once been a pirate, said that the soft and melancholy cry of this Dove, heard about the wells which the pirate crew had dug in one of those Keys, awakened in his heart

feelings of penitent sorrow. So deeply was he moved by the notes of the bird, the only soothing sounds he had heard while in his wild career, that he determined to desert his ship and try to escape. He returned to the well, and listening to the cooings of the Zenaida Dove, he prayed for mercy, and became again an honest man.

This bird places her nest on the ground, sometimes very carelessly, and at other times closely covered with tufts of grass. When sitting, she seldom leaves her nest, unless some one tries to catch her; then she waits and watches until the hand is almost on her, and she is off in a twinkling. The Zenaida is about the size of the Turtle Dove; plumage above, light brown, tinged with gray; underneath, brownish red, also passing into gray.

The Passenger Pigeon, of America, *Ectopistes migratorius*, is the most remarkable member of this whole family, on account of the untold numbers of the flocks in which it moves from place to place. Both Audubon and Wilson

give accounts of them which are almost too wonderful to believe. Audubon left his home, in Kentucky, one morning, and as the Pigeons were flying very thickly, sat down to count the flocks as they passed. He put down a dot for each flock, and in twenty-one minutes had noted one hundred and sixty-three dots. He went on his way, and at night reached Louisville, fifty-five miles distant, but the Pigeons were yet flying, and so continued for three days! "A hawk chanced to press upon the rear of a flock. At once, like a torrent, and with a noise like thunder, they rushed into a compact mass, pressing upon each other toward the center. In these solid masses they darted forward in indulating and angular lines, descended and swept over the earth with inconceivable velocity, mounted perpendicularly so as to resemble a vast column, and when high were seen wheeling and twisting within their continued lines, which then resembled the coils of a gigantic serpent." If one wished to see the scene repeated, he had only

to wait until the next flock came up, when it would follow through the same movements.

"As soon as the Pigeons discover sufficient food to entice them to alight, they fly in circles, reviewing the country below. During the evolutions on such occasions the dense mass which they form exhibits a beautiful appearance as it changes direction, now displaying a glistening sheet of azure, when the backs of the birds come together into view, and anon, suddenly presenting a mass of deep, rich purple. They then pass lower, over the woods, and for a moment are lost among the foliage, but again emerge and are seen flying aloft. They now alight, but the next moment, as if suddenly alarmed, they take to wing, producing by the flapping of their wings a noise like the roar of distant thunder, and sweep through the forest to see if danger is near. Hunger, however, soon brings them to the ground. When alighted they are seen industriously throwing up the leaves in quest of fallen mast. The rear ranks are continually rising, passing over the main

body, and alighting in front, in such rapid succession that the whole flock seems still on the wing. The quantity of ground thus swept is astonishing, and so completely has it been cleared that the gleaner who might follow in the rear would find his labor completely lost. Whilst feeding, their avidity is so great at times that in attempting to swallow a large acorn or nut they are seen gasping a long while, as if in the agonies of suffocation."

The same author visited a nesting place of the Pigeons, on Green River, in Kentucky. It occupied a part of the dense forest, where the trees were large and the underbrush scanty, and extended over a space forty miles long and three miles wide. The birds had been there about two weeks, and a large number of people from all directions had encamped near the border. Some had come more than an hundred miles, and had driven their hogs to fatten upon the Pigeons. Towards night every body prepared to receive the flock with pots of burning sulphur, torches, poles, and guns.

"Suddenly there burst forth a general cry of 'Here they come.' The noise which they made, though yet distant, reminded me of a hard gale at sea, passing through the rigging of a close reefed vessel. As the birds passed over me I felt a current of air that surprised me. Thousands were soon knocked down by the pole-men; the birds continued to pour in, the fires were lighted, and a most magnificent as well as wonderful and terrifying sight presented itself. The Pigeons arriving by thousands alighted every where, one above another, until solid masses as large as hogsheads were formed on the branches all around. Here and there the perches gave way with a crash, and falling on the ground destroyed hundreds of the birds beneath, forcing down the dense groups with which every stick was loaded.

"It was a scene of uproar and confusion; no one dared venture within the line of devastation; the hogs had been penned up in due time, the picking up of the dead and wounded

being left for next morning's employment. The Pigeons were constantly coming, and it was past midnight before I perceived a decrease in the number of those that arrived. Towards the approach of day the noise in some measure subsided; long before objects were distinguishable the Pigeons began to move off in a direction quite different from that in which they had arrived the evening before, and at sunrise all that were able to fly had disappeared. The howlings of the wolves now reached our ears, and the foxes, lynxes, bears, raccoons and opossums were seen sneaking off, whilst eagles and hawks of different species, accompanied by a crowd of vultures, came to supplant them and enjoy their share of the spoil."

This Pigeon feeds on mast, which includes beechnuts, acorns, and chestnuts, and on all varieties of grain, seeds, and berries. The amount which such enormous flocks consume must be likewise enormous. Wilson describes a flock of Pigeons a mile wide and two hundred and forty miles long, and assuming that

there were three birds in every square yard, and that each bird eats half a pint of food a day, their daily rations would amount to seventeen million bushels. For this reason their range of feeding must be very great, or they would soon leave famine behind them. They can the more easily extend their flight by their large and strong wings, so that in a few hours they may have removed to a distant land. One was shot, in the State of New York, whose crop was full of rice, which he must have gathered in the rice swamps of Carolina, and which could not have been in his crop more than six hours without being changed more than it was. The distance must have been at least three hundred miles, so that his speed could not have been less than fifty miles an hour. When settlements have become numerous, and the Pigeons have been much hunted, the large flocks become scattered, and the birds are shy.

The length of the wild Pigeon is about sixteen inches, but the long pointed tail occupies quite a portion, and the actual size is rather

less than that of the common Dove. The plumage is bluish-gray above; the breast is reddish-brown; the neck is shot with gold, green, and purplish crimson; the wings and tail are edged with white. Two or three broods are hatched each season, each brood consisting of a male and female.

A beautiful bird is found in the Pelew Islands, called the Oceanic Fruit Pigeon, *Carpophaga oceanica*. It is a forest bird, and is very fond of the mace, or outer covering of the nutmeg. This food gives its flesh a very delicate aromatic flavor, which makes it in great demand. During the nutmeg season it becomes very fat, so that it even bursts open when brought down by the gun. Besides its value for food, it is very useful in planting the nutmeg tree. It swallows the nutmeg, with its covering, but only the mace digests, and the nut is not only uninjured as it passes through the bird's stomach, but it is with difficulty made to grow in any other way; when planted

by man it must pass through a peculiar preparation to make it come up.

This bird wears a singular knot at the base of the upper part of the beak, about the size and shape of a cherry. The plumage of the back is light green; the throat and breast are rusty gray, and the neck gray, shot with blue. The length is about fourteen inches.

The most conspicuous of the family is the Crowned Pigeon, *Gaura coronata.* It is a native of Java, and New Guinea. It is very large, and its crest gives it an appearance quite unlike the rest of the pigeons. It has a majestic gait, and a queer habit of lying in the sun with its wing stretched over itself, stiff, and spread like a tent. Its cry is loud, and sounding, like a mixture of trombone and drum, and when it utters its note it bows so low as to sweep the ground with its crest.

In the Mauritius, about two hundred and fifty years ago, the Dutch voyagers found a large bird which naturalists have classed with the Pigeons. This bird the old Dutchmen

called Dod-aers, meaning bird-that-wallows, and the word has been contracted to Dodo. The species has long since vanished, and now nothing is left to prove that it ever lived, except a few drawings, and the head and feet of a single specimen.

One voyager wrote of it: "It hath a great ill-favored head, covered with a kind of membrane resembling a hood; a bending, prominent, fat neck; an extraordinary long, strong, bluish-white bill. Its gape, huge, wide, as being naturally very voracious. Its body is fat and round, covered with soft, gray feathers, after the manner of an ostrich. It hath yellow legs, thick, but very short; four toes in each foot; solid, long, as it were scaly, armed with strong black claws. The flesh, especially the breast, is fat, esculent, and so copious that three or four Dodos will sometimes suffice to fill one hundred seamen's bellies."

They were so plentiful at one time, and so easily killed, that the sailors were in the habit of slaying them for the stones found in their

stomachs, which the men used to sharpen their clasp-knives.

In this instance an entire race of creatures has vanished from the earth, within the memory of man. The records of the rocks show that many other species, even entire orders of animals, have disappeared in like manner. So also other races have been created and placed in such circumstances as were adapted to their growth and preservation. Each species has had the form, the clothing, the habits which the Creator gave it at its beginning of life, and no instance has ever been found in which one tribe, or family, or species, has gradually changed and developed into another.

THE CARRION CROW. *Corvus corone.*

About Crows.

Order — *Insessores.* — Perchers.

Tribe — *Conirostres.* — Having cone-shaped bills.

Family — *Corvidæ.* — Latin, *Corvus*, a Crow.

COME we now to a family of birds which seldom find favor with man. In the first place they are black, and there has always been a certain foolish and groundless prejudice against any creature which wears that sombre color; — a black sheep is the derision of the flock; a black cat is the fit confidant of a witch; the prince of evil is painted black, though some have

thought him not so black as he is painted; a black man is hardly admitted to the rights of manhood; the only exceptions are dogs and horses; — and Crows are black. In the next place, in the great variety of things which furnish them a living, they persist in eating certain items which man claims as his, and denies their right to, particularly corn. Besides, some of them like meat which has been kept too long, that is, longer than man keeps that which he eats, and they eat it without cooking, or seasoning. Lastly, they are very cunning, and when man sets a price on their scalps, they contrive to keep their heads as much out of his reach as they can, even helping each other, while they jeer at him, and call after him, and ridicule him, with their hoarse crow laughter, for thinking he can catch them. So people give them bad names, deem them birds of foul omen, and will not recognize the good they do, in spite of all the ill usage they endure. For it is manifestly absurd that a bird should wear black, eat corn, like high-flavored flesh,

and avoid a gun, unless he has something sinister and wicked in his nature.

The first of these birds is the Raven, *Corvus corax*. He lives alone, in the wildest regions he can find, preferring a hilly country. He finds a home in all quarters of the globe, from Japan, through Europe, to America, and even in the coldest arctic winter, when wine freezes near the fire, he flies, croaking his hoarse cry, as carelessly as if the weather were that of returning spring. His food is mostly animal, and is not chosen with much care. In his long flight, if he pass a sheep or lamb which is sick, or has a broken leg, or lies floundering in the mire, he takes pity on it, and then picks its bones. Although very cunning, he may be brought within gun-shot, if one will lie on his back in an exposed place, — without moving, for, "though glad to find others carrion, or to make carrion of them, he takes good care that none shall make carrion of him. But if you lie on your back, he will come, you know not whence, and hovering round you on slow wing,

examine you on all points. If you do not stir he will drop down at a little distance and begin to hop in a zig-zag fashion, bringing his shoulders forward alternately. Sometimes he will utter his 'cruck-cruck,' and pause to see if that makes you stir, and if it does not, he moves on faster."

The Raven also eats all kinds of small game, and of birds; even the spines of the hedgehog will not protect from him. In the west he follows the hunter to feed on the offal of the game.

His craft is well illustrated by an anecdote related by Captain McClure, the arctic discoverer. Two Ravens were often seen about the ship, where she was frozen into her winter quarters. As the refuse of a meal was thrown out for the dog, the Ravens would put themselves in his way, as if inviting him to make his supper of them. The dog would run at them, and they would fly just out of his reach; then he would make another run, and so they tempted him on, until he was quite a distance

from the ship. Then they would fly back to the meat, and devour quite a portion before the dog could see the joke and rush back again.

The Raven is often captured while young, and tamed, but he makes a most troublesome pet. Unless placed where he can do no possible harm, he will get through more mischief in an hour than a squad of boys in a day, and he sets about his work as gravely, and labors as earnestly and persistently, as if he had a duty to do, which he was paid for and could not morally neglect. One used to watch a gardener while training some choice plant. The bird would sidle up to it, as if he did not see it, and with one wrench of his strong beak would lay it flat on the ground. The lady who owned the garden declared that the Raven was possessed by an evil spirit. He would follow behind her, and, as she turned, would still hop behind, so that she could never see him. His mischief could not be borne, and he was killed.

Another was an adept at fighting dogs. When the dog made a rush upon the bird, it would

step backward, and at the same time deliver a sharp blow with its pointed beak upon the dog's nose. A second rush would be parried in the same style, and so on until the dog could endure no more, and gave up. Another Raven was equally skillful in fighting cocks. When his enemy made the attack he would quickly step aside and avoid the blow, until at a convenient moment he would suddenly end the combat by biting off his antagonist's head.

The Raven was the first bird sent from the Ark, after the Deluge, which did not return; perhaps that was the same

> "Ghastly, grim and ancient Raven,
> Wandering from the nightly shore,"

which Poe saw in his delirious dream; which

> "Perched above a bust of Pallas,
> Just above my chamber door,
> Perched, and sat, and nothing more."

The ancient Romans connected many superstitions with the Raven. They watched his manner of flying, and from that pretended

to foretell if a journey would be safe or successful. They thought that a man who should eat the heart of a Raven would become a soothsayer.

How much pleasanter the remembrance that the Ravens fed Elijah in his hiding place beyond the Brook Cherith, bringing him "bread and flesh in the morning, and bread and flesh in the evening."

The Raven is about two feet long, and is really a handsome bird. His color is a uniform blue-black, with green reflections. His beak is high, round and knife-shaped, and surrounded at the base with bristles. Instances have been known where he has lived to the age of seventy or eighty years without showing any signs of old age.

Next of kin is the Carrion Crow, of Europe, *Corvus corone.* This is the bird the poets sing of, and is quite different from our American Crow. In habits he is much like the Raven. He got the prefix "carrion" because they said he would eat such food, and very

likely he would yet if he could find it, but, instead, he has usually to make his living upon reptiles, frogs, small birds, and whatever he can get. He often visits the sea-shore for the shell-fish which he can pick up, and if the shell is too hard, he takes it up with him, and drops it upon a rock to break it. He flies only with his mate, and builds his nest upon some tall tree, often near some dwelling. He is about eighteen inches long, and wears a black and very glossy coat, with reflections of purple above, and of green beneath.

The American Crow, *C. Americanus*, is smaller than his English namesake, and is not, like him, solitary, but gathers in flocks. He is about seventeen inches long; his color is glossy blue-black. About the middle of March the Crows begin to build their nests, usually in some high tree. They are made of sticks, bark, and moss, compacted with mossy earth, and are lined with quite a quantity of horse-hair, cow-hair and wool. On this soft and elastic bed are laid four pale-green eggs,

spotted with olive. When the female is sitting the male watches about her and brings her food, while both restrain their noisy chatter.

In May and June the Crow does most mischief, pulling up the corn as it comes up in the fields, so that the farmer has often to plant his ground a second or even a third time. For this he gets no mercy. The myriads of mice, beetles, caterpillars and grubs which he has destroyed are forgotten. He is an outlaw and must be executed. But first to catch him. In vain the gunner ranges for him, steals along the hedges, or hides in ambush. Some sentinel Crow, perched on a high tree, gives the alarm, and, far and near, the Crows answer and fly. When the man is gone, and the coast is clear, they return and finish their meal.

The persecution of the Crow makes him very crafty. The farmer often posts in the middle of his field an effigy of a man, made of a ragged suit, stuffed with straw, but the Crow understands that well enough. He does

not fear a live man unless he carries a gun, and as for a straw man, — he will stand on his shoulder and pick the oats out of his ear. Sometimes a wind-mill is contrived to make a constant clatter upon a tin pan, but the Crow soon gets used to that, — he can make more noise himself. But when the farmer stretches strings hither and thither across his fields the Crow is in doubt. There is some mystery about those lines which he can not fathom, and his caution keeps him out of the way.

In some states rewards have been offered for killing Crows, as for destroying panthers, wolves and foxes. They have been caught with clap-nets, and poisoned with drugged corn. Some have been taken with pieces of paper rolled up into cones, and smeared inside with bird-lime. A kernel of corn is put in the bottom of the cone, and when the Crow puts his head in, to take the corn, the lime glues the paper to his face, and shuts his eyes. One farmer exposed a dead horse near his barn.

As the crows gathered he shot them from a hiding place within, and so killed more than six hundred during the winter. The bounties on Crows and the price of the quills nearly paid for the horse, and the feathers filled a feather bed!

Yet, says Audubon, "The Crow devours myriads of grubs, every day in the year, that might lay waste the farmer's fields. It destroys quadrupeds innumerable, every one of which is an enemy to his poultry, and to his flocks. I can but wish men would reflect a little, and become more indulgent toward our poor, humble, harmless, and even most serviceable bird, the Crow."

In particular, the Crow is very fond of the "cut-worm" which does so much mischief by eating off corn, and other vegetables, just at the surface of the ground. There are hardly any of our insect-eating birds, which, at times, do not find it necessary to eke out their living with grain, chiefly corn. For this offence, eastern farmers have waged war upon

birds of all kinds to such an extent that their numbers have been much diminished, and, as a result, the number of harmful insects is very much increased. A quantity of English Sparrows was lately imported into New York to destroy the insects, but if our native birds could live unmolested, they would do all that is needed, and if they can not live, the sparrows will be likely to suffer the same fate.

The Crow is easily tamed, and then his true genius begins to be known. He soon learns all the members of the family, and screams at a stranger; can open a door by alighting on the latch; is very regular at breakfast and dinner, recollecting punctually the hour; is very noisy and talkative; can speak words quite distinctly; is a great thief, and hider of curiosities, secreting in holes and odd corners every article he can carry away, particularly small pieces of metal, corn, bread, and other kinds of food. A story is told of one which lived for some time in a family, and at length disappeared. It was supposed that he had

been shot. About eleven months after, while his master was standing by the river, one of a flock of Crows, which passed by, alighted on his shoulder and began to gabble away with great earnestness, as if he had found an old friend. The gentleman recognized the bird, and made several attemps, in a quiet way, to lay hold of him; but the Crow was too wary to be caught, and flew away after his companions.

A somewhat noted bird of this family is the Rook, *C. frugilegus.* This bird seems to be hated by English farmers quite as the Crow is hated by Americans, and the warfare between them is conducted in very much the same way. The farmer puts up scarecrows and racket-mills, and shoots the Rook when he can, while the Rook picks up the farmer's corn, bores holes in his turnips, eats his chickens, and keeps shy of his gun. The naturalists admit that the bird does some mischief, but contend that he does a great deal more good. They insist that he cares more for the wire-worm at

the root of the corn, than for the kernel, and that the worm would kill that shoot and many more. They prove that he consumes many beetles, both in their perfect state, and while they are grubs, and that both beetles and grubs are very destructive. So the Rooks seem to have the best of it, after all.

They live in colonies, many thousands sometimes finding a home on the trees of a single park. They pile sticks together into large and rather clumsy nests, and gather some softer material on which to lay their eggs. In these bird-towns there seems to be certain unwritten laws which the birds understand and obey. One law forbids any Rooks from dwelling in the limits of the town, except those born there; another forbids young Rooks from locating at a distance. Either crime provokes a conflict which ends in the destruction of the nest of the guilty parties. The old birds continue to use their nests year after year, cleaning them a little each Spring. The young ones, just beginning to keep house, have to

build for themselves. If the young birds build too near the old ones, it creates trouble, and the intruders have to move.

The Rooks are also said to hold courts for the trial of offenders. Some morning a great noise is heard in the rookery. The birds gather upon a few trees, and one, who sits by himself, with drooping head, seems to be the center of the disturbance. After much croaking, and flying hither and thither, in which may easily be imagined the examination of witnesses, the pleas of advocates, the charge of a judge, and the verdict of a jury, the birds fall upon the culprit and execute sentence of death. They particularly punish such lazy and dishonest Rooks as will not go away and bring sticks for their own nests, but stay at home and rob the nests of others. They are so intelligent as to observe the marks made on the trees which are to be cut for timber, and will not build, or allow the young birds to build on them.

They entice the young birds from the nest

as soon as they can flutter to another tree. For a little time they return to the nests to roost, but soon leave, and are gone during the Summer. In Autumn they return again, and sometimes make a few repairs upon their nests, but their voices have acquired a softened tone, and their meeting seems rather a mournful procession revisiting old scenes, than the noisy and busy throng of Spring. In a few days they are gone again for the Winter.

The Rook is about nineteen inches long; color, blue-black, glossed with purple. He may be distinguished from the Crow by a bald place on his forehead, and also at the base of the neck, where the feathers do not grow again after the first moulting.

The Jackdaw, *C. monedula*, is another English bird of this family, of infinite wit and humor. When wild he has many of the habits of the Rook. The greetings which Mudie describes between a flock of Rooks and one of Jackdaws, would make it appear that they understand each other. "When the

cawing of the Rooks on their morning flight was heard, the Jackdaws, which had previously been still and quiet, instantly raised their shriller notes, and flew to join the Rooks, both parties clamoring loudly, as if welcoming each other; and on the return the Daws accompanied the Rooks a little past their home; then both cawed their farewell and departed. What is more singular, I have seen, too frequently for its being merely accidental, a Daw return for a short time to the Rooks, a Rook to the Daws, or one from each race meet between, and be noisy for a space after the bands had separated. With the reason I do not interfere, not being in the secrets of either party; but the fact is as certain as it is curious."

In captivity the Jackdaw is a very amusing bird, and learns some very curious tricks. Wood says of one: "He was imitative in the extreme, and more than once had put the house in danger by his passion for lighting friction matches, of which amusement he was

as fond as any child. On one occasion he lighted the kitchen fire in the course of the night. The cook had laid the fire over night, intending to apply the match early in the morning. The Jackdaw contrived to get hold of the match-box, and had evidently rubbed the match upon the bars, and so set fire to the combustibles, as the cook found the fire nearly out, the Jackdaw in the kitchen, and some eighteen or nineteen exploded matches lying in the fender.

"The first time that this Jackdaw lighted a match he was so frightened at the sharp crackling report that he ran away as fast as he could go, coughing and sneezing after his fashion from the fumes of the sulphur, he having held the match close to the phosphoric end. He never seemed to distinguish the ignitible end of the match, and would rub away with great perseverance on the blank end, without discovering the cause of his failure. By degrees he contrived to singe all the feathers from his

forehead and nostrils, and once burned his foot rather severely.

"He was greatly afraid of thunder, and had a singular power of predicting a coming storm. In such a case, he would retire to some favorite hiding place, generally a dark hole in the wall, or a cavity in an old yew which exactly contained him, and would there tuck himself into a very compact form so as to suit the dimensions of his hiding place, his body being tightly squeezed into the cavity, and his tail projecting along the side. In this odd position he would remain until the storm had passed over, but if he were called by any one whom he knew, his confidence would return, and he would come out of his hole very joyously in spite of the thunder, crying out, 'Jack's a brave bird!' as if he entirely understood the meaning of the sentence. He may possibly have had some idea of the words, for he hated being called a coward, and would resent the term with all the indignation at his command."

The nest of the Jackdaw is rudely made in a hole of some decayed tree or old building. His general color is black, marked on the back of the head and nape of the neck with gray. He is fourteen inches long.

There are many more birds belonging to this large and interesting family, which are worthy of notice, but we shall only speak of one, the Magpie, *Pica caudata.* This bird is common in Europe, and in the south-western parts of the United States. His food is as various as that of the Crow. He is a constant robber of birds'-nests, eating the young, or stealing the eggs by driving his bill through them and flying away. He robs hens' nests in this fashion, and gets caught by it. The farmer takes away all the eggs but one, and that he empties and fills with bird-lime. Mag spears it, and flies away with his prize; he soon finds that it will not slip off his beak as he would like, and he batters it against a tree with a smart blow which scatters the adhesive

bird-lime over his head and wings, and makes him an easy prey.

The nest of the Magpie is built high in the tree. It is roofed over with thorns, leaving a hole just large enough to admit the owner. The building of nests is the subject of a curious fable.

"The birds, not knowing how to build nests, went in a body to ask the Magpie to teach them, which he was willing to do.

"'First,' he said, 'you must look out for a good strong, forked branch and begin by laying two sticks crosswise.'

"'That's just what I did,' said the Rook.

"'Next, you must raise the sides a little, and then put in some hay, which you must work well into the sticks.'

"'The very thing I have been doing,' said the Crow.

"'Now, for fear the eggs should be thrown out, you must raise the sides about as high as your head when you sit in the bottom of the nest, and put in some soft wool.'

In England there are many superstitions concerning this bird. To see one, or two, or three together, is a sign of something, good or bad, while the ways in which the birds fly are of much consequence. Even so lately as in 1860, a request was made officially to the authorities at Dresden, in Germany, for a supply of Magpies. They were to be perfect, even to claws and feathers, and must be shot between the 24th of December and the 18th of January; they were to be made into a powder supposed to be a valuable remedy for the disease called epilepsy.

The signs are relics of the ancient art of divination, by which the people of Pagan Rome were humbugged. As for the medicine, being only dried and pounded meat, it is probably as effective as many other innocent prescriptions now much in fashion, whose only influence is on the imagination of the patient. Doubtless many persons recover after taking the medicine, and sometimes in spite of it.

GROUP OF HUMMING-BIRDS.

About Humming-Birds.

VERTEBRATA. — AVES.

ORDER — *Insessores.* — Perchers.

TRIBE — *Tenuirostres.* — Having thin bills.

FAMILY — *Trochilidæ.* — Greek, *Trochilus*, the name of a small bird.

HUMMING-BIRDS live in America, and are found in some variety from Canada to Patagonia, though known in no other land in the world. Some of them wander over large distances, migrating like the larger birds; others are restricted to very narrow limits, only a few hundred yards wide, and on the slopes of a single mountain. They are most numerous in

Mexico and about the Equator. They are very small, always on the wing, swift as light, of very varied and curious forms, and splendid with gorgeous colors, which flash in the sunlight like the most brilliant and precious gems. When flying they move too swiftly for the eye to follow, and we see them suddenly appear, hover for an instant, and then as swiftly vanish. This rapid motion of their wings causes a low hum, like that made by some insects, and hence we call them Humming-Birds; in other languages their names have the same meaning. The hum differs in tone with the different species, so that a practiced ear can tell which kind is near, even before it is seen. The Black Cap, for instance, gives a tone like that of a wheel driven by machinery, while another gives the droning hum of a very large bee.

The wings of the Humming-Birds are long and slender, like those of the swallows, and when folded, they usually extend beyond the tail. When hovering over a flower, the wings

move so rapidly as to seem only like two filmy fans fastened to the bird. The legs are weak. The tails are strong, like the wings, and have every variety of form. Some are pointed, others round or square, others are forked; some are very long; others have but six feathers; but in all cases the tail has considerable motion, and, like a rudder, turns the course of the bird to the right or left, up or down.

There has been much dispute about the food of these birds, some claiming that they lived upon insects, others that they sucked the honey of flowers, like the honey-bees. It is now understood that their food consists of both honey and insects. The naturalist, Webber, tamed several of these little birds. At first they were very fond of the syrup which he furnished them, but after a while they began to droop, and he let them fly. They soon returned, as fresh as ever, for the supply of sweet food which they knew they should find. This occurred again, and when

they were next set free, Mr. Webber and his sister watched them very carefully.

He says: "We were sadly puzzled to think what it was they were dipping at so eagerly in the shrubbery, to the utter neglect of the many flowers. We moved closer to watch them to better advantage, and in so doing changed our relative position to the sun. At once the thing was revealed to me. I caught Ruby in the very act of taking a small spider, with the point of his long beak, from the center of one of those circular webs of the garden spider, that so abound in the South. The thing was done so daintily that he did not stir the dewdrops, which, now glittering in the golden sun, crowded the gossamer tracery, all diamond strung.

"Our presence did not disturb them in the least, and we watched them catching spiders for half an hour. They frequently came within ten feet of our faces, and we could distinctly see them take the little spider from the center of the wheel where it lies, and swallow it

entire. After this, we let them out daily, and although we watched them closely, and with the most patient care, we could never see them touch the spiders again until the usual interval of about a fortnight had passed, when they attacked them as vigorously as ever; but the foray of one morning seemed to suffice. If we shut them up past the time, until they began to look drooping, and then brought one of those little spiders with other insects, they would snap up the spider soon enough, but paid no attention to the others."

The bills of the Humming-Birds are all thin and sharp, but vary considerably in curvature, and in some other respects. Each species has the form, straight or curved, turned up or down, which is best fitted to reach its food in the deep cups of the flowers which it visits. The tongue is long, thread-like, and double nearly to the root. At the throat it joins a curiously forked bone which passes on either side of the neck, and round the back of the head, ending in the forehead. This is so

arranged that the bird can thrust its tongue out a long distance, and pick up an insect or gather a drop of honey at the bottom of the long tube of a flower. The common woodpecker has such a tongue, and can use it in the same way.

More than three hundred species of these little birds are known, and others are continually being discovered.

The Humming-Bird most common at the North is the Ruby-throated, *Trochilus colubris.* Its plumage is golden-green above, golden-red about the throat, fine purple-brown on the wings and tail, and white beneath. The general tint of the throat is ruby, but it varies, as the light is reflected from it, from deep black, through every shade of red and green, to a glow of light, like the blaze of a furnace at white heat; and all these hues have the same radiant, metallic lustre.

The Ruby-throat is a bold little fellow. He is so swift of wing that he cares not for hawk or owl, and will even drive away the eagle

himself, when the royal bird ventures too near his home. He has been seen to perch upon the head of the bald eagle, and peck away with right good will, tearing out the white feathers, while the great bird dashed screaming through the air, unable to get rid of its tiny torment.

As the bird is only three and a half inches long, his nest is very small. It is round, neatly made, with thick walls and a small hollow. The bird usually fixes it upon the top of a bough, but sometimes fastens it to the side of the trunk; in either case it is made so much like a knob of the tree, that only a practiced nest-hunter would perceive it. The female is very cautious when going to the nest. When she is near it she rises high in the air, out of sight, and then drops quickly down in the place, before one who is watching would be done looking where she vanished. The nest is woven of the cotton-like wings of certain seeds, like the downy thistle. These are wrought into a strong soft wall, and are covered with the mosses which grow near by

on the stems of the tree. In this tiny bed, lined with the wool from the mullen stalk, the bird lays two little pearly eggs.

We have already mentioned Mr. Webber's Ruby-throats, which he let loose occasionally to hunt for spiders. He caught them by tempting them into a room with vases of fresh flowers, and then closing the window after them. Several injured themselves by dashing against the window pane. Finally one was caught in the hand, and when he came to look at it, the little fellow pretended to be dead. It lay on the open palm for some minutes without any motion; then gently opened one of its bright eyes to see if the way was clear, and closed it again when it saw its captor watching it.

A mixture of two parts of loaf sugar, one of honey, and ten of water, was brought, and a drop was touched to the point of its bill. In an instant it came to life, and was on its feet, sipping the food from a spoon. When it had taken enough, it sat upon the finger, and

plumed its wings as if quite at home. By the next day it would come from any part of the room, alight on the edge of the china cup which held its food, and drink eagerly, thrusting in its bill to the very base. A family of these birds, which Mr. Webber had tamed, migrated at the usual season, but the next year returned again and flew at once to the well-known window. When the cup of nectar was prepared for them, they came and supped, and brought their mates with them, so that quite a company of the beauties feasted with him.

Wilson relates that one which he captured seemed to suffer from cold, and to be almost dead; he carried it into the sunshine, and it soon revived, flew to a twig for a moment, and then vanished in the sunshine. It is possible that this, like Webber's bird, was only "playing 'possum," and that others which have been said to die from fright, were not quite so far gone as they wished to seem.

The Long-tailed Humming-Bird, of Jamaica, *Trochilus polytmus*, is a species which does not

migrate. The upper parts of this bird are green, glossed with gold, the wings purple brown, the tail black, with a steel-blue reflection. The throat, breast and under parts are a glowing emerald green. The whole length of the male bird is about ten inches, of which the tail is three-fourths. The female wants the long tail feathers, and is only about four inches long.

It is easy to catch these birds with a gauze net, but they usually die soon after. A few which were taken from the nest were tamed. Like the Ruby-throat, they fed upon nectar, with a meal of insects by way of a change. Each bird in a room had its own place for resting after flight, or at night, and would not allow another to occupy it; even if their owner wished to make them change places, they were uneasy, and each tried to regain possession of his own.

The nest is made of fine moss, cotton fibre, and spider-web, and is covered with mosses; it is hung to a bough or twig, and in one case

was suspended over the sea-waves by the twigs of a wild vine.

Some of the Humming-Birds have a tuft of white downy feathers, like a powder puff, about each leg. These are called Puff-legs. The Copper-bellied Puff-leg, *Ereocnemis cupreiventris*, is found in Santa Fé de Bogóta. It dwells in a belt of land from six thousand to nine thousand feet above the level of the sea, probably because its food is found only in that locality. The general color of this bird is green, washed on the back with bronze, on the breast with gold, and underneath with copper, whence its name. The wings are brown and purple. The puffs are snowy white, like swan's down.

One family wears a gorget of bright feathers about the throat, which gives them the name Flame-bearers, *Selasphora*. The Little Flame-bearer, *S. scintilla*, lives in the crater of an old volcano in Veragua, nine thousand feet above the sea. It is only two and a half inches long, and its flame is so bright that, as Mr. Gould

remarks, it seems to have caught the last spark of the volcano before it went out.

Nuttall describes a Flame-bearer, *S. rufus*, which he found on the Columbia River, in Oregon. "We saw the males in numbers, darting, buzzing and squeaking in the usual manner of their tribe; but when engaged in collecting its accustomed sweets in all the energy of life, it seemed like a breathing gem, a magic carbuncle of glowing fire, stretching out its glorious ruff as if to emulate the sun itself in splendor. Towards the close of May the females were sitting, while the males were uncommonly quarrelsome and vigilant, darting out at once as I approached the tree, like angry coals of brilliant fire, passing within very little of my face, returning several times to the attack, sailing and darting with the utmost velocity, at the same time uttering a curious sharp bleat, somewhat similar to the quivering twang of a dead twig, yet also so much like the real bleat of a small quadruped, that for some time I searched the ground,

instead of the air, for the actor of the scene. The angry hissing or bleating note seems something like *whi'i'i'i'sh vee*, tremulously uttered, and accompanied by something like the whirr of the night-hawk."

A very beautiful variety is the Sappho Comet, or Bar-tailed Humming-Bird, *Cometes sparganurus*. It is a native of Bolivia, and quite familiar, hunting the gardens and orchards, for the flowers of the apple and other fruit trees; it visits the cactus flowers for an abundant supply of insect food. The nest is made of fibres and moss, and has a long tail or queue, but what for no one knows. It is lined with hair, and is hung against the side of a rock or wall, supported either by the wall, or by some twig or swinging root. The bird always selects some place which is sheltered by an overhanging ledge. The body of this bird is light green, bronzed on the side of the neck; the lower part of the back is crimson red. The tail is formed like the letter V, each branch consisting of four fiery red

song of the nightingale; or the nightingale mourn for the golden glories of the Humming-Birds. So ought men, to whom good gifts have been in like manner variously distributed, to be content with that which they have severally received.

It has been suggested that all these are but the outward signs of love. "It may be, therefore, that on the one side the bird which has a good voice and plain dress, pours forth his love, and shows his sympathy, in gushing strains, which are addressed to the ear of his mate; again, the bright plumaged bird utters his voiceless song by the vivid hues that flash from his glittering attire, the eye being the only medium through which his partner, whose ears are not attuned to melody, could realize the fullness of his utterance. The one showers his musical tones like vocal rainbows, and the other scatters his rays of many-colored light in flashing hues or blending tints, and whether in sweet song or glittering vesture, the creature utters the love and sympathy of its nature."

THE SNOWY OWL, WITH OWLETS. *Nyctea nivea.*

About Owls.

VERTEBRATA — AVES.

ORDER — *Accipitres.* — Hawks.

FAMILY — *Strigidæ.* — Latin, *Strix*, a Screech Owl.

ERHAPS no family of birds have been misrepresented more commonly, or more unreasonably, than the Owls. In all countries, and in every language, the very name is a word of ridicule or of reproach, while the cry is supposed to foretell some fearful event. Goldsmith accuses him of treachery because he seeks his food by night — the bird is so made that he can not see by day — and because he steals upon

his prey, very much like the lion, who is called a noble animal, and the king of beasts.

The naturalists have given these birds names which suggest something noisy or disagreeable. The unlearned say of a stupid fellow, "he looks as wise as an owl!" But the Owl is not as fierce as the eagle, as cruel or unclean as the vulture, as noisy as the peacock, or as stupid as the ostrich; in fact he has just about as much cunning and prudence as the other birds of prey. He does the work that he was fitted to do. He flies by night, because he was made to feed on prey that is active at night. He sings just as sweetly as nature intended he should sing, and if he makes his nest in ruinous towers, it is because they afford him and his young a secure and quiet home.

The Owl has, usually, a large head, with a strong hooked beak; great, staring eyes, which look straight forward; a circle of feathers which surround each eye and partially cover the beak and the ear, and which make the large eye seem still larger; strong curved

claws, and soft, downy plumage, generally spotted with various shades of brown or yellow. His legs and feet are often feathered to the toes, and his claws admit of much motion, so that he can hold very small prey. His eyes are fitted for seeing in the dark, or at twilight. Some species see very well even in the day time, and others are quite dazzled by daylight. His flight is easy, buoyant, and noiseless, on account of the softness of his feathers. In a word, an Owl is very like a feathered cat, just as a cat is like a furred Owl. He feeds on birds, rats, mice, and small game of all kinds, swallowing his prey entire, and casting up the indigestible parts in small pellets. His nest is rudely constructed in the hollow of an old tree, in a fissure or cave in a rock, or among the crevices of some ruined wall. So on her

> "ivy-mantled tower
> The moping Owl does to the moon complain
> Of such as, wandering near her secret bower,
> Molest her ancient, solitary reign."

The Owl family may be divided into three branches. First, there are the Owls proper, having large external ears and the circles of feathers about the eyes entire, and which are nocturnal in their habits; next, the horned Owls, whose external ear is small, and which wear a tuft of feathers, like a horn, on each side of the head; and last, the hawk Owls, which have small eye-circles, and neither outer ear, nor feathery tufts.

The chief of the last family is the Great Snowy Owl, *Nyctea nivea*. This Owl, from its beauty, bravery, and endurance, has been called the King of the Owls. It dwells in the northern parts of both continents, where it finds its food and rears its young, among the wastes of rock and ice, in spite of the violence of arctic storms. In those regions where so much labor and life have been wasted in fruitless search for an impassable passage from European to Asiatic seas, this bird has been found at the most northern point, better

prepared by nature to endure the extreme cold, than men, with all the resources of art.

The whole plumage of this bird is pure white, without any marks whatever; the young birds, however, are marked with dark spots at the tip of each feather. The beak and claws are black. The eyes are bright as gold; by daylight they are very brilliant, and at night they glow like twin balls of fire. A story is told of a Snowy Owl, which alighted on the rigging of a ship to rest itself, after a long flight. A sailor who was sent aloft on some duty, speedily came down again, in a great fright, sure that he had seen "Davy Jones" sitting on the main yard, and glaring at him with his great eyes.

These eyes are fixed in the Owl's face so that he can not turn them, but his neck is so fitted that he can turn his head quite round without moving his body.

The food of this Owl varies with the season. In the short summer it takes many of the small birds. In autumn it flies low, and feeds upon

the grouse or ptarmigan, and when these are gone, it goes to the water and catches fish, waiting on the rock as patiently as a human angler. When the country is covered with snow, many of the smaller animals are driven upon the surface to seek the bark of bushes and trees, and on these the Owls manage to keep alive, until the melting snows disclose the bodies of creatures which perished under the sweeping storms of the preceding winter. Thus they live during all the year, and do not leave their snowy realms until driven to the last extremity.

In the great plains which border the Missouri and its branches, a small animal called the Prairie Dog is found in great numbers. These marmots — for such they are — something midway between a squirrel and a woodchuck — live in troops, and dig their burrows with considerable regularity, like towns, leaving streets between their burrows. The towns seem to be governed by some old fellow, whom the hunters call Big-Dog, who sits before the

entrance to his burrow, and issues his orders as mayor.

While no danger is feared, the towns-people are full of life, sitting on the mounds of earth which are left before each burrow, or running about to visit their neighbors. Suddenly a sharp yelp is given; at once quick barks reply on every side; the air is filled with a cloud of dust; nothing can be seen but a confused mass of whisking legs and tails, and the busy town is desolate. In a few moments a pair of eyes are peering out at one hole, a whisker peeps out at another, and presently all come forth again, as lively as before. But these animals are not suffered to occupy their towns in quiet. The vicious and the idle gather among them, and do them no small harm. Lizards creep into their houses; the deadly rattlesnake comes after their little ones, and a kind of burrowing Owl finds it more convenient to take possession of a marmot's burrow than to dig one for itself. This Owl, *Athene cunicularia*, has been accused of going after the young marmots, but

there is no evidence that it eats any thing but insects, and the "mice and such small deer" as come in its way. Its color is a rich brown upon the upper parts, spotted with grayish white, and whitish beneath. It is about eleven inches long. Its cry is much like the sharp, quick bark of the Prairie Dog.

The Great Horned or Eagle Owl, *Bubo maximus*, is the largest of the family, and seems to be nearly as large as the Golden Eagle. It is really much smaller, and owes its apparent size to its feathers, not to its body. Its weight is about one fourth that of the Eagle, but in power of muscle it is hardly inferior. It is found in Europe. Its place is occupied in America by the Virginian Eared Owl, *Bubo Virginianus*. This bird is a terrible destroyer of game, picking up grouse, partridges, hares, ducks, squirrels, and even attacking the wild turkey. The Owl tries to find a place where the turkey is asleep, and then swoops down upon its victim before it awakes. Sometimes the turkey is roused by the rush of wings, and

then it instinctively spreads its broad tail over its back and ducks its head. The Owl finds nothing but stiff, smooth feathers to grasp, its talons glide off from the protecting quills, and so the turkey escapes.

The color of this bird is reddish brown, marked with spots of black, brown, and gray, and covered with innumerable specks. Its large eyes are golden orange; beak and claws large and black; legs short and strong, and thickly clothed to the very claws with fine, downy plumage. The broad tufts, which resemble horns, are about three inches high, formed of twelve or fourteen black feathers edged with brownish yellow. Its flight is very powerful, easy, and graceful. Its voice is hollow; when heard by night it causes even a manly heart to quake.

"Along the mountainous shores of the Ohio, and amidst the deep forests of Indiana," says Wilson, "this ghostly watchman has frequently warned me of the approach of morning, and amused me with his singular exclamations,

sometimes sweeping down and around my fire, uttering a loud and sudden *Waugh O! Waugh O!* sufficient to have alarmed a whole garrison. He has other nocturnal sounds, not less melodious, one of which resembles the half suppressed screams of a person suffocating, or throttled, and can not fail of being very entertaining to a lonely, benighted traveler, in the midst of an Indian wilderness."

The Mottled Owl, *Scops asio*, a small and handsome species, sometimes called the Little Screech Owl, is common throughout the United States. It is oftenest seen in autumn and winter, when forced to approach barns or houses in search of mice. During the day it hides in hollow trees or thick evergreens, and it is subject to great derision and insult, even amounting to blows, if found by any of the smaller birds. It is about ten inches long, dark brown above, shaded with paler brown, and spotted with zigzag points of black and ash; the face is whitish, and the breast is marked with lines of black and brown on a whitish ground.

The Tawny Owl, *Surnium aluco*, is the one which, in England, makes night dismal with its loud lamenting cry. It is a sage looking bird, and among the rustics has a variety of names, screech-owl, madge-howlet, and Peter, being the most common. Its head and legs are very large, and it stands quite erect, so that it looks like a little fat old man, with plenty of wig, great round spectacles over a hooked nose, and an air as grave and reverend as a judge. Its soft feathers make it seem much larger than it really is, and as they are poorly fitted to keep out the wet, a rainy day reduces its size about one half. The rain, however, does not trouble it much, for, if it soon gets wet, it soon gets dry again.

A gentleman allowed a pair to build a nest in the attic of an unoccupied house. He says: "I should have been a little afraid of molesting them, so fierce did the old gentleman look when his wife and children were approached. One morning the cat was missing, and I found that some strange sounds had been heard the

evening before in the room where the Owls were. On going up that evening, I found poor puss quite dead, one of her eyes actually pecked out, and her antagonist, also dead, lying on the side of the nest. The mamma Owl was away, probably in search of food, but she may have been present and assisted at the death. I have seen a cat, at another time, cowed by an old Owl that came down the chimney into the dining room."

The length of this bird is about fifteen inches. Its beak is white; eyes blue; the circles round the eyes white, streaked with brown; plumage tawny brown, darkest on the head and back, lightest on the breast, and spotted or barred with light or dark brown. Its screeching and its hooting are alike dismal. It sharply cries *too-whit*, or utters an inward tremulous *too-whoo*, with a gloomy and subdued shivering, any thing but merry.

The Barn or White Owl, *Strix flammea*, is a delicately colored and soft plumed bird, always found near dwellings and farmyards, where it

loves to live, not for the sake of eating young chickens, but for the mice which make such havoc in the grain stacks and corn cribs. The number of mice which it destroys is almost incredible. Mr. Waterton estimates that when a pair of these Owls are rearing a brood, they bring to the nest four or five mice every hour. This gentleman established a colony of Barn Owls in the ivy which adorned the ancient gateway of his mansion. They multiplied rapidly, and repaid his protection by ridding the out-buildings of the great numbers of rats and mice with which they were infested. They were not sparing, it is true, of their music, which though rather discordant, was doubtless the best they could afford. Sixteen months after the apartment over the old gateway had been cleaned, more than a bushel of the pellets or castings of these Owls was gathered, each pellet containing the skeletons of four to seven mice. The amount of service done by a pair of Owls must therefore be greater than that of a large number of cats,

while their music could hardly be less agreeable.

The Owl has two ways of eating. If he has caught a mouse and is going to eat it, the mouse is first bitten smartly across the back so as to destroy all life, and when it hangs motionless from the bird's beak, it is tossed into the air very adroitly, so as to fall with its head downwards. The Owl then catches the head in his mouth, and holds it for a few seconds; then a sharp toss sends it down his throat, leaving the tail hanging out, usually at the left side of the bird's beak. The bird rolls this about for a bit, as a boy would a stick of candy, or a man a cigar, and then another jerk puts all out of sight. But when the Owl has to deal with a bird, like others of the hawk tribe, he strips off the feathers, and tears it to pieces.

This bird is easily tamed when young, and makes a very amusing pet. One each formed a friendship with a tame skylark, which he allowed to sit on his back, and to bury itself

in his soft plumage. This bird was an active enemy of bats, and killed small birds, as well as mice. It used to push its prey into a hole in the wall, made by the fall of a brick. In this odd larder was found a strange variety of game. Six or eight small birds would be counted early in the evening, and once as many as fourteen bats had been poked into the hole. Several times the bird had stowed away a moderate sized eel, which it had killed by a bite across the back.

Another tame Owl was approached by a dog, which came up to inspect the stranger. The Owl quietly rolled over on its back, and when the dog put his nose to the bird, it struck with its feet so sharply that it put out both the eyes of the poor dog, which had to be killed on account of the injury.

Many other species of Owls are named, but they agree in general appearance and habits with those we have described. They are all sober, sedate birds, hard-working and provident for their families, but solitary and seclu-

ded in their habits, minding their own business. But there is something in these very solitary habits, and something so discordant in their tones, when heard in the gloomy silence of night, that have impressed men with fear and dislike of the whole tribe. There is no good reason for this superstitious awe. There is nothing in the Owl supernatural or mysterious, or more than belongs to any bird of prey which hunts by night and rests by day. Its harsh voice, caused by its wide throat, serves, as was doubtless meant by its Creator, to alarm its prey, and make the frightened animals stir; thus the slight movement and consequent rustle shows the bird its game.

Although we must think that the reputation of the Owls is worse than their character, after all their character is none of the best. There is nothing pleasant in their appearance, nothing agreeable in their manners, nothing genial in their disposition or habits. They live only for themselves. Their good qualities are mostly negative, and the best we can say is, that they

might be worse. There are men and women of whom we have to say the same.

"In the hollow tree, in the old grey tower,
The spectral Owl doth dwell;
Dull, hated, despised, in the sunshine hour,
But at dusk he's abroad, and well!
Not a bird of the forest e'er mates with him,
All mock him outright by day;
But at night, when the woods grow still and dim,
The boldest will shrink away.
Oh! when the night falls, and roosts the fowl,
Then, then is the reign of the Horned Owl.

"And the Owl hath a bride who is fond and bold,
And loveth the wood's deep gloom;
And with eyes like the shine of the moon-stone cold,
She awaiteth her ghastly groom:
Not a feather she moves, not a carol she sings,
As she waits in her tree so still,
But when her heart heareth his flapping wings,
She hoots out her welcome shrill!
Oh! when the moon shines, and dogs do howl,
Then, then is the reign of the Horned Owl.

Mourn not for the Owl, nor his gloomy plight!
The Owl hath his share of good;
If a prisoner he be in the broad daylight,
He is lord in the dark greenwood!

Nor lonely the bird, nor his ghastly mate;
They are each unto each a pride;
Thrice fonder, perhaps, since a strange dark fate
Hath rent them from all beside!
So when the night falls, and dogs do howl,
Sing Ho! for the reign of the Horned Owl!
We know not alway
Who are kings of day,
But the king of the night is the bold brown Owl.

BARRY CORNWALL.

About Kingfishers.

VERTEBRATA — AVES.

ORDER — *Insessores* — Perchers.

TRIBE — *Fissirostres* — Having bills which open wide.

FAMILY — *Alcedinidæ* — Latin, *Alcedo*, a kingfisher.

USUALLY there is, in midsummer, a time when nature seems asleep. The warm rays of sunshine do not crowd every leaf and twig with springing, budding life. The birds fly lazily through the still air, under a cloudless sky. The winds are whist. The waves of lake and ocean forget their tumult. Even the "multitudinous laughter" of the sea subsides into a placid smile,

and only the faintest splash is heard as the swells break idly on the beach.

The ancients called these Halcyon days, and we use the word as signifying days of peaceful rest, forgetting that Halcyon days means Kingfisher's days. The fable was that Alcyone, the Kingfisher, had some charm by which the winds and waves were stilled to rest, and kept at peace fourteen days, while the bird made its nest upon the water, and hatched its young. This charm was aided by the sweet song of the bird. The fact was, that those who invented this story, with all the fables that go with it, did not know where to look for the Kingfisher's nest, and as she lives about the water, they guessed that she, somehow, reared her young there. She does not make her nest on the water, or on land, or on a tree, but in a hole in the ground. The place chosen is at the foot of a bank, near the water, and is usually the burrow of some four-footed animal. The bird hollows out the inner end until large enough for her purpose, and takes

care to choose a burrow which slopes upward, so that the nest may be out of danger from water. The nest itself is made of fish bones, which the Kingfishers cast up from the fish eaten, just as the owls eject the indigestible parts of their food. The walls are about half an inch thick, and the shape is quite flat. The way in which the bones are arranged shows that the bird really forms them into a nest, and does not merely lay her eggs at random upon them. The partial decay of these bones is probably the reason why a Kingfisher's nest, and the bird itself, have such a vile and unendurable stench.

Mr. Gould thus describes his experience in procuring a nest:

"During one of my fishing excursions on the Thames, I saw a hole in a steep bank, which I felt assured was a nesting-place of the Kingfisher, and on passing a spare top of my fly-rod to the extremity of the hole, a distance of nearly three feet, I brought out some freshly-cast bones of fish, convincing me that I was

right in my surmise. I again visited the spot with a spade, and after removing nearly two feet square of turf, dug down to the nest without disturbing the entrance hole, or the passage which led to it. Here I found four eggs, placed on the usual layer of fish bones; all of these I removed with care, and then filled up the hole, beating the earth down as hard as the bank itself, and replacing the sod on top, in order that the barge-horses, passing to and fro, might not put a foot in the hole. A fortnight afterwards the bird was seen to leave the hole again, and my suspicion was awakened that she had taken to her old breeding quarters a second time.

"Twenty-one days after, I again passed the top of my fly-rod up the hole, and found not only that the hole was of the former length, but that the female was within. I then stuffed a large mass of cotton to the extremity of the hole, in order to preserve the eggs and nest from damage during my again laying it open from above. On removing the sod and dig-

going down as before, I came upon the cotton wool, and beneath it a well-formed nest of fish bones, the size of a small saucer, the walls of which were fully half an inch thick, together with eight beautiful eggs, and the old female herself. The mass of bones, weighing 700 grains — about an ounce and a half — had been cast up and deposited by the bird, or the bird and its mate, besides the unusual number of eight eggs, in the short space of twenty-one days."

The Common or Belted Kingfisher, *Ceryle alcyone*, is familiar all over North America. He is about thirteen inches long. His back, and a belt across his breast, are blue; the under parts, and a spot before each eye, white; the tail black, barred with white. The head wears a long crest. His sudden scream is shrill and harsh, quite like the sound of a watchman's rattle; one would think not well adapted to lull waves, or any thing else, to rest. The Kingfisher sits quietly for hours on the branch of some tree which overhangs

the water, and then, with a loud scream, descends, and quickly rises again, bearing a fish in his beak. This he takes back to his perch, batters smartly against the branch, and swallows. Then he watches for another, and so keeps at work till he has eaten enough. His sight is very keen, and he finds his prey even in the turbid rapids of a waterfall. He knows, too, how to take a position which will make the best of the sunshine.

One sunny afternoon the writer was observing a Kingfisher, which sat upon a naked limb of an oak, overlooking the water. For a long time the bird saw nothing, and did not move. Presently he left his perch, and flew along the margin of the lake, rather in the direction of the sun. After going a few rods, he stopped, turned his back to the sun, and for a few seconds stood balanced on his beating wings, and looked intently into the water. Then he turned, went on a few rods further, again turned his back to the sun, repeated his careful gaze, and again went on. At the third or fourth pause,

he spied a fish, and dropped upon it like an arrow. At each pause he placed himself in the air, over the water, so that the reflections from the surface would be turned away from him.

His flight consists of five or six flaps, followed by a glide. When he pauses, he seems to stand upon his feet and beat the air with his wings, as a swimmer "treads" water.

The bird occupies the same nest year after year. Audubon tried to catch one in its burrow. He first set a net over the opening, but the bird crept out between the meshes and the earth. Next he found the bird in its hole, and he thrust a stick into the opening, thinking that he could blockade it until morning; but the Kingfisher scratched his way round the stick, and so raised the blockade.

A bird quite like the Belted Kingfisher, is the Spotted Kingfisher of Asia, *Ceryle guttata*. The natives call it *Muchee-bag*, or Fish-tiger. It is about fifteen inches long, with a beak three inches long. Its plumage is jet black,

spotted thickly with white, and its head wears a large crest of the same colors.

The Great African Kingfisher, *Ceryle maxima*, is about as long as the one last mentioned, but his body is rather larger. The back is dark ashen-gray, nearly brown, and marked with numerous small white spots. The lower surface is grayish-white.

The English Kingfisher, *Alcedo hispida*, is about seven inches long. Its coloring is quite brilliant, and complex. The top of the head, back of neck, and back, are dark green, flecked with bright spots of blue. The lower part of the back is light violet, or blue, and the tail indigo. The under parts are chestnut. Although thus brilliantly colored, it loses its gay appearance when seen against fresh white snow. This bird catches his prey quite like the Belted Kingfisher. If he can take more than he wishes to eat, he stores the remainder away, until he gets hungry. One chose a crevice made by the roots of a willow tree, and would sometimes have four or five fish in his larder

at once, some of them large enough to cook. He will sometimes pounce upon a fish too large to be swallowed, and has been choked to death by his greediness. One is said to have caught and tried to swallow a young dab-chick, which is a small bird of the duck family.

The most fatal case is related by Mr. Wood. A gentleman watching the birds, fish and insects which were playing about a stream of water, saw a strange blue object floating down the current, and splashing with great energy. On looking closer he found that a Kingfisher had caught and partially swallowed a fish too large for him to manage; while the contest was going on, a broad-nosed pike came up, and swallowed both fish and bird. The same person asserts that the Kingfisher is fond of slow, solemn music, and will linger to listen to it, but is driven away if more lively tunes are played.

If not disturbed this bird becomes quite familiar. A fisherman threw away a f

which was too small for his purpose. A Kingfisher upon a tree near by picked up the rejected fish. Another was too small, and thrown by, which the bird also ate. Upon this quite an intimacy sprang up between the two anglers; the man made a peculiar whistle when he threw a fish, and the bird soon learned to come at the call. This friendship lasted for several years. Others have been reared from the nest, but they require a large amount of food, and soon learn that is much easier to be fed than to get their own living.

In some parts of England the country people take this bird, remove the entrails, stuff the interior with spices, and then dry him in the sun. The bird is then hung by the point of the beak to a beam in the ceiling, so that it will turn freely, and they say that it always turns its breast towards the point from which the wind blows.

The islands of the Eastern Archipelago furnish several notable varieties of this family. Indeed, the largest species lives in Australia,

and is called the Giant Kingfisher, or Laughing Jackass, *Dacelo gigas*. The settlers give it this name from its loud, discordant cry, which is a strange, grating laugh, more startling than that of the hyena, and by no means agreeable to one who is not familiar with it, in the lonely wilderness. The Laughing Jackass has quite an inquisitive nature, and if a fire is made, it often glides silently into the thicket near by, and utters its yell from one of the branches. The stranger is alarmed, but the old hand unconcernedly shoots the intruder and cooks him for his supper.

At sunrise and sunset this bird becomes very noisy, as well as at dawn and at nightfall. So the white men sometimes call him the "Settler's Clock," while the natives call him *Gogobera*.

His food is not altogether fish, but he gobbles insects, snakes, and even small quadrupeds. He is said to be a handsome bird, the upper plumage being various shades of brown, and the under parts white, barred with brown. His length is about eighteen inches.

Another Australian Kingfisher, *Halcyon sancta*, is nearly as large as the Laughing Jackass. It feeds on insects, which it seizes in its bill, and thumps on the ground smartly; it also eats the crabs and prawns which are thrown on shore by the tide. Sometimes it tears ant-hills in pieces, and devours the inhabitants, with their young. Many other species are described, but they are not greatly different in form and habits from those we have men-mentioned.

THE MOCKING BIRD. *Mimus polyglottus.*

Of Certain Sweet Singers.

WE purpose to group together in this article several birds whose only claim of kinship lies in their song. We have already observed the general rule, that those birds which wear the gayest plumage do not usually excel in singing, while those which make the woods and meadows ring with their delicious music, are clad in gray, quiet robes. For all that, we like the homely singers best. There is something inspiriting in the rich, rollicking trill of a bird. It makes us feel that spring has come; that nature has awaked from sleep; that all the

air, the earth, the plain, the forest, the garden, the field, are full of earnest, gushing, overflowing life. As the little warbler rises in his melody, how his whole being is poured into his song! His very attitude — every feather and fibre alive, his wings spread and quivering, his eye on fire, and his full, bursting throat — tells in what downright earnest he is. And then the liquid notes, clear and sharp, or soft and mellow, how they harmonize, each with each, and, with the myriad other tones, the voiced stops of nature's grand organ, the deep diapason of the cataract and the storm, the clanging trumpet of the thunder, the viol of the babbling brook, the dulciana of the sounding pine, and even the tingling voices of the silent stars, combine to swell the choral strain which all God's works continually do chant.

Men often try to imitate the songs of birds, or to represent their strains by words, and the attempt always fails. The letters in our words represent sounds which we utter with our

mouths and throats, and which are different from those that birds make, because our vocal organs differ from theirs. Our letters will not express their tones, and if we should invent new letters for them we could not speak the words which those letters would form. Something may be done by musical notation, but the signs will only indicate the pitch, without showing the quality of tone, or giving the articulation, two of the most important items in bird-music. A person may as easily have an idea of a perfume which he has not smelled, or of a color which he has not seen, as of a bird's song which he has not heard.

Some years since, a young and wealthy Cuban, then my pupil, brought to my room a beautiful music-box, which he had just received from Paris. It was small, easily carried in the pocket, elegantly carved with flowers and fruit, and was ornamented upon the top with a gold engraved plate, about the size of a half dollar. My friend wound up the mechanism and touched the spring. A few notes of prelude,

and then a pause. The gold plate lifted itself, and a jeweled branch rose up, bearing a little bird. His shape, his attitude, were perfect; every feather was in its place. He seemed to sing, and as the tune flowed on, his tiny ivory bill opened and shut, and quivered in the trills, his head moved from side to side, his wings rose and fell, and even his feet appeared to clasp the branch closer as his body waved. In a few moments the song ended. With the last exulting note, the bird closed his wings, bowed his head, and bird and branch vanished under the closing lid. In all respects it was a piece of most exquisite workmanship, but it lacked the inimitable grace of the living bird, and its music was but the lifeless tinkle of the music-box. We peeped under the edge of the lid, and there the bird lay upon its side, curiously folded away, indeed, a dead automaton. It was a wondrous specimen of delicate mechanism, but for its value as a bird, one living, breathing, warbling thrush were worth a thousand such.

The Canary.

Tribe — *Conirostres* — Having cone-shaped bills.

The first bird which we shall mention is the Canary, *Carduelis canaria.* About three hundred years ago a ship which was bringing a large number of these birds from the Canary Isles, was wrecked on the coast of Elba, in the Mediterranean. The birds escaped, and settled themselves on shore. Some were caught by the people, and for their sprightliness and their fine singing, were much admired. They were soon carried to Italy, and from there all over Europe. The native color of the Canary is not the bright yellow which we commonly see, but a kind of dappled olive-green, black, and yellow, either color being at times the most predominant. The Germans and the Tyrolese take great pains in breeding Canaries, while societies for that purpose have existed in London for more than a hundred years. Amateurs distinguish more than thirty varieties, which are divided into two classes,

the Plain and the Variegated; the first are called Gay Spangles, and the latter Mealy Birds. The green, or mealy birds, are thought the strongest, and to have the best song. Those which are pure yellow are called Jonquils. The tendency seems to be toward a return to the darker kinds, so that a green bird is often found in the nest even when two pure gay birds are mated.

The birds are worthy of care and study for their sprightly temper, but they are chiefly valued for their loud and varied song, which is continued through most of the year. Some will even sing in the evening, if brought into the light. The melody of the song sometimes opens with that of the nightingale; others begin like the skylark, and after running through a variety of modulations, end like the nightingale. Those which have this song are esteemed most; after them the English birds, which have learned the song of the wood-lark. Some have been taught to descend the scale of the octave in a clear, silvery tone, and to introduce a trumpet-like song.

Wood describes one which learned to talk. Its parents, finding it the only one hatched out of four eggs, neglected it, and began to build a second nest above it; it was, therefore, taken out of the cage and brought up by hand. As it was constantly talked to, when about three months old, it surprised its mistress by saying, "Kissie, kissie," and by making the sound of kissing. Afterward the little bird repeated other words, as, "Kiss dear Titchie," "Sweet pretty little Titchie," (its name), "Kiss sweet Minnie," and similar phrases. It did also whistle the first bar of "God save the Queen."

In Germany the breeders of Canaries have a large house made for them, with a square space at each end, planted with trees; the birds may come out from the house through holes left for the purpose, and feed upon the seed, chickweed, and other food provided for them. The interior of the house is kept dark, and bunches of broom are placed for the birds to build in. They may easily be bred without so much expense; a large cage will answer very well.

Particular care should be taken of the caged birds, in giving them regularly clean seed, fresh water, with enough for bathing, a supply of bone to aid their digestion, and a frequent taste of some fresh, green herb, as chickweed, or lettuce. The cage should be kept scrupulously clean, and the perches should be washed often, lest their feet become sore. If the birds seem dispirited and drooping, it is often caused by minute red mites, almost too small to be seen, which infest them, prevent their sleep, and destroy their health. If a cage be brought into a strong light in the evening and a white napkin thrown over it, in a few minutes they may be seen, tiny red spots on the cloth. They may be driven from the cage by scalding with hot water, or by applying neats-foot oil to every place where the insects can find shelter. The little block of wood at the top of a round wire cage, is usually a resort for them. A kind of powder is sold, which, when rubbed into the feathers of the bird, will destroy the vermin.

The Sky-Lark.

Tribe — *Conirostres.* — Having cone-shaped bills.

The Sky-Lark, *Alauda arvensis*, is a bird much praised by all English writers. Jeremy Taylor said "it did rise and sing as if it had learned music and motion from an angel." It sings while on the wing. At first, as it springs from the ground, its notes are low and feeble, but its music swells as it rises, and long after the bird is lost to the eye it continues to charm the ear with its melody. Even then, a practiced ear will know the motion of the bird by his song. It climbs up to the sky by a flight, winding like a spiral stair, constantly growing wider. It gives a swelling song as it ascends, and a sinking one as it descends; and if it takes but one turn in the air, that whirl is either upward or downward, and varies the pitch of the song. The natural impulse to throw itself up when it sings is so great, even when confined, that it leaps against the top of the cage, and would injure itself if the roof

were not covered with green baize to receive the shock.

The nest of the Lark is concealed in some hollow in the ground large enough to hold it. Usually it is hidden by a tuft of grass or leaves, and by the quiet color of the dry grass, leaves, and hair, of which it is made. The bird does not seek the society of man, but is not much disturbed if he comes near. One sitting on her nest was passed over by the mower's scythe, which cut away all her concealment, but did not injure her. She did not fly, and a person who returned in an hour to see if she was safe, found that she had built a dome over herself with dry grass, leaving an opening for passing in and out.

A gentleman riding on horseback had a Lark drop suddenly upon the saddle before him, with wings outstretched, as if wounded to death. When he tried to lay his hands on it, it moved over the horse, and finally fell on the ground between the horse's feet. As the rider looked up, he saw a hawk ready to pounce upon the

Lark, as soon as it should leave its place of refuge. Afterwards it again mounted the saddle, and at the first opportunity flew into the hedge, and was safe.

A pair of Larks had hatched a brood of young in a grass field. The grass had to be cut before the young ones could fly, and as the mowers approached the nest, the old birds were much alarmed. Finally, the mother laid herself flat on the ground with wings outspread, and the father, by pulling and pushing, drew one of the young on her back. She flew away with that, and soon returned with another. This time the father took his turn, and thus they carried away all the young before the mowers reached the place. At another time a Lark attempted to carry away its young in its claws, but the little bird dropped from a height of about thirty feet, and was killed. They have been known to carry away their eggs, grasping them with their two feet.

In the spring and summer the Larks live in pairs, but in autumn they gather in large

flocks, and before snow falls they become very fat, when thousands are killed for market. The back of the bird is brown, blackish brown, and gray; the lower parts dingy white. It is about seven inches long, the tail being three inches. In size it is about as large as a bob-o-link.

The Nightingale.

Tribe — *Dentirostres* — Toothed-billed.

Our next bird is the famed Nightingale, *Luscinia philomela.* It is unknown in America, but in England and throughout Europe it is deemed the prince of singers. In the evening, after most of nature's sounds are hushed, the Nightingale begins his song, and sings, with little rest, all the night. It rarely sings by day, and those kept in cages are often covered with a cloth to make them sing. It is very shy; professed naturalists know but little of its habits. Mudie says: "I watched them very carefully for more than five years, in a place where they were very abundant, and at

the end of that time I was — about as wise as at the beginning."

The Nightingale begins to sing in England in April. Its music is loudest and most constant when it first comes, for then the males are singing in earnest rivalry to attract their mates. When the female has made her choice, her mate becomes much attached to her, and if he should be captured, pines and dies. But his song grows less, and after the eggs are hatched, it ceases altogether. The bird catchers try to secure the singers during the first week, for then by proper care they may be made to sing a long time.

The song of the Nightingale can not be described, even though one gentleman has printed nearly half a page of what he calls a literal version of it. Here is a specimen: "Spe, tiou, squa,—Quio didl li lulylie — Lu ly li le lai la, leu lo, didl io quia!" Can you hear it?

The listener is astonished to hear a volume of sound so rich and full proceed from the throat of so small a bird. Besides its strength,

its delightful variety and exquisite harmony make its music most admirable. Sometimes it dwells on a few mournful notes, which begin softly, swell to its full power, and then die away. Sometimes it gives in quick succession a series of sharp, ringing tones, which it ends with the ascending notes of a rising chord. The birds which are free do not sing after midsummer, while those which are caged will often sing until November, or even until February. The young birds need to be under the training of some older one, and will often surpass their teacher; few become first-rate.

The nest of the nightingale is not built in the branches, or in a hole, or hanging in the air, or quite on the ground, but is set very near it. It is not easily found, unless the movements of the bird betray it. The materials are straw, grass, little sticks, and dried leaves, all jumbled together with so little art, that one can hardly see it when it is right before him. If the same materials were seen any where else, they would seem to have been

blown together by the wind, and stopped just there by a fork in the branches. There are four or five smooth, olive-brown eggs. The bird is about six inches long, and weighs three quarters of an ounce. Its colors are dark brown above, and greyish white below.

Izaak Walton saith: "But the nightingale, another of my airy creatures, breathes such sweet, loud music out of her little instrumental throat, that it might make mankind to think that miracles are not ceased. He that at midnight, when the very laborer sleeps securely, should hear, as I have very often, the clear airs, the sweet descants, the natural rising and falling, the doubling and re-doubling of her voice, might well be lifted above earth, and say, Lord, what music hast thou provided for the saints in heaven, when thou affordest bad men such music on earth!"

The Mocking-Bird.

Tribe — *Dentirostres.*

Although America wants the Nightingale, the queen of English bird-song, we have an equally noted, and more wonderful singer, in the Mocking-bird, *Mimus polyglottus.* Every one who hears this bird is fascinated with its thrilling song. Within its throat every bird seems to sing, for it can reproduce all their notes, from the soft twitter of the blue bird to the rich jargon of the thrush, or the shrill scream of the eagle.

"Yes, they are all here! Hear, then, each warble, chirp, and trill. How they crowd one upon another! You can hear the soft flutter of soft wings as they come hurrying forth! Hark, that clear, rich whistle! 'Bob White, is it you?' Then the sudden scream! is it a hawk? Hey! what a gush, what a rolling, limpid gush! Ah, my dainty redbreast, at thy matins early? Mew! what, Pussy? No, the

cat-bird; hear its low, liquid love-notes linger round the roses by the garden walk! Hillo! listen to the little wren! he must nearly explode in the climax of that little agony of trills which it is rising on its very tip-toes to reach! What now? Quack, quack! Phut, phut, phut! Cock-doodle-doo! What, all the barnyard? Squeak, squeak, squeak, pigs and all. Hark, that melancholy plaint, Whip-poor-will, how sadly it comes from out the shadowy distance! What a contrast! the red-bird's lively whistle, shrilly mounting high, higher, highest! Hark the orchard oriole's gay, delicious, roaring, run-mad, ranting riot of sweet sounds! Hear that! it is the rain-crow, croaking for a storm! Hey day! Jay, jay, jay! it is the imperial dandy blue-jay. Hear, he has a strange, round, mellow whistle, too! There goes the little yellow-throated warbler, the woodpecker's sudden call, the king-bird's woeful clatter, the the dove's low, plaintive coo, the owl's screeching cry and snapping beak, the tomtit's tiny note, the kingfisher's rattle, the crow, the

scream, the cry of love, or hate, or joy, all come rapidly, in unexpected contrasts, yet with such clear precision that each bird is expressed in its own individuality."

When the bird becomes acquainted with man, he adds a new stock to his vast store of sounds. He imitates the bark of the dog, the harsh setting of saws, the whirring buzz of the millstone, the click-clack of the hoppers, the dull, heavy blow of the mallet, the fragments of song whistled by laborers or sung by milkmaids, the creaking of wheels, the neighing of horses, the baa of the sheep, the deep low of the oxen, and all the unnumbered variety of sounds produced by men.

Besides all this, he has a song of his own. His own native notes, which are distinct from all the others, are bold and full, and very varied. They consist of short phrases, of two three, or perhaps five or six notes; often interspersed with imitations, and all uttered with great rapidity and emphasis, and continued for half an hour at a time. Indeed, many think

the imitations decidedly injure his song; for in the midst of the most inspiring strain, he will often turn aside to introduce some jarring, grating discord. While singing he spreads his wings, expands his tail, and leaps about his cage as if, in ecstasy, he would dance to his own music.

Each bird is master in his own district. When one begins to sing, the others cease, or go so far away that their voices seem but the echo of his song.

His nest is in some thick bush, and is carefully concealed. While the female is sitting, the male watches with jealous care, and will not allow hawk or snake to come near. The black snake, which seeks for its eggs and young, is often driven away by this courageous bird. Dogs are forced to run away from its sharp beak, and a cat finds the ascent of the tree under the furious thrusts which are pecking her nose and blinding her eyes, a task too great for her endurance.

The color of the mocking-bird is a dull

brown, with a decided ashy tinge. The chin, throat, and under parts are pale brown, inclined to gray. The male is known by the breadth and pure tint of the white band on the wings. His length is about nine inches.

THE TRICOLOR-CRESTED COCKATOO.

Cacatua Leadbeateri.

About Parrots.

VERTEBRATA — AVES.

ORDER — *Scansores*. — Climbers.

FAMILY — *Psittacidæ*. — Parrot-like.

BENEATH the luxuriant forests of tropical countries, where animal life of every kind develops the most singular forms, and the most brilliant colors, the large and numerous family of Parrots is very conspicuous. Its various sub-families, Parrakeets, Parrots, Lories, Macaws, and Cockatoos, are distinguished chiefly by variations in the form of beak or tail. All have large and strong beaks; the upper mandible, or jaw, is curved very

much, shutting down over the lower mandible, and is sometimes very long. The tongue is short, thick, and fleshy; its shape gives these birds their remarkable power of imitating human speech.

The first branch, the Parrakeets, or Paroquets, have small bodies and long tails. They dwell mostly in Australia, and the islands adjacent.

A beautiful example is the Rose-hill Parrakeet of New South Wales and Van Dieman's Land, *Platycercus eximius.* The head, sides of the face, back of the neck, and breast, are glowing scarlet; the chin and upper part of throat are pure white; the feathers of the back are very dark black-green, broadly edged with an exquisite hue of light green; the wing-shoulders are shining lilac, mixed with black; many of the wing-plumes have a black-green centre, with golden-yellow edges, and a bright green spot at the tip; the central tail feathers are dull green, the others lilac blue, darkest near the quills, and shading to almost white at

the tips; beneath the tail the feathers are light scarlet, and the under parts of the body are white, shading into light green.

This bird eats a great variety of seeds and insects. It is hardy, and thrives in a cage. Its voice, a rather pleasant low whistle, is not harsh like that of many other parrots. In its home, it lives in the open country in little companies; in certain localities it will be very abundant, and between them, for long distances, not one will be found.

The Ground Parrakeet, *Pezophorus formosus*. This bird has none of the gay colors of the former, yet is very pretty. Its barred plumage, dark green above, mottled with yellow and black half-moon spots, and yellow beneath, similarly spotted, with long tail feathers alternately barred with red and green,—its habits, and its strong game odor, give it a marked resemblance to the pheasant, so that the Australian colonists call it by that name. On the ground it runs very swiftly, winding its way in and out among the stiff grass stems, so

shrewdly as to baffle almost any dog. As a last resource it takes flight, but soon alights again, and hides in the tufts of grass. Its flesh has a flavor equal to snipe, and almost to quail. Its white eggs are laid on the ground.

Another elegant variety is the Ringed Parrakeet, *Palæornis torquatus*, a native of both Asia and Africa. The ancients brought this bird to Rome from Ceylon; ever since it has been a favorite cage-bird. Wood tells of one which was brought from India to London, through the kindness of an old weather-worn sailor, who took her into his berth, and warmed her in his bosom, while the others on board perished during the cold nights of the passage. Soon after her arrival, a great clattering was heard in the parlor, and Polly was found in a very talkative mood, riding about the room on the cat's back, while pussy marched on with the greatest gravity. It was her habit to sit at table on her master's shoulder; if she wanted any thing, she pecked at his ear; if the wea-

ther was chilly, she climbed up by his whiskers, and warmed her toes on his bald head.

This bird does not speak very distinctly. It is very docile. One which was taken into a school room was at first so noisy as to stop all recitation. She was soon taught silence by banishment, at every transgression, into a dark closet. It became very amusing to see her stretch out her head to speak, and then, as she remembered, suddenly check herself.

The general color of this bird is grass-green. The feathers on the head shade from green through blue to a fine purple at the nape of the neck. Just below the purple is a narrow band of rose color, and below that a streak of black, narrow at the back, and growing broader towards the front — hence the name *torquatus*, wearing a collar. The upper mandible is coral-red; the lower, blackish. Its length is fifteen to eighteen inches, and its size that of a wild pigeon.

The Macaws live mostly in South America, Their cheeks are without feathers, their tail-

feathers long, their beaks large and strong. They usually dwell in forests, where the ground is swampy. They fly high, and oftenest perch on the tops of the tallest trees. Their colors are so varied and intricate that written statements give but feeble notions of their actual splendor. Among the most noted varieties, specimens of which are often seen in menageries, are the Red and Blue, Blue and Yellow, Scarlet, and Great Green Macaws.

Waterton writes of the Red and Blue Macaw:

"Superior in size and beauty to any Parrot of South America, the Ara will force you to take your eyes from the rest of animated nature and gaze at him. His commanding strength, the flaming scarlet of his body, the lovely variety of red, yellow, blue and green in his wings, the extraordinary length of his scarlet and blue tail, seem all to join and demand for him the title of emperor of all the parrots. He is scarce in Demarara until you reach the confines of the Macoushi country; there he is in vast

abundance; he mostly feeds on trees of the palm species.

"When the coucourite trees have ripe fruit on them, they are covered with this magnificent parrot. He is not shy or wary; you may take your blow-pipe and a quiver of poisoned arrows, and kill more than you can carry back to your hut. They are very vociferous, and like the common Parrots, rise up in bodies towards sunset, and fly, two and two, to their places of rest. It is a grand sight in ornithology to see thousands of Aras flying over your head, low enough to let you have a full view of their flaming mantles. The Indians find their flesh very good, and the feathers serve for ornaments in their head dresses."

A bird which should be included among the Macaws, is the Carolina Parrot, *Conurus Carolinensis*, of North America. It dwells throughout the Southern States, and, according to Wilson, may be found along all the tributaries of the Mississippi and the Ohio, as far north as Lake Michigan. On the Atlantic coast, it rare-

ly goes farther north than Maryland. It is peculiarly fond of the burrs of the cockle, whose prickly hooks do so much mischief by clinging to and working into the fleeces of sheep; in some cases the wool is so filled with cockles that the trouble of cleaning it is more than its value. Besides these burrs, this Parrot eats beech-nuts, and the seeds of cypress trees.

At the Big Bone Lick, on the Ohio river, about thirty miles from the mouth of the Kentucky, Wilson found them in great numbers; they came to drink the salt water. On the ground they seemed to spread a carpet, gay with green, orange, and yellow; afterwards, on the boughs of a tree, which they appeared to cover entirely, they presented a most gorgeous appearance, as the sunlight was reflected from their brilliant plumage.

"Having shot one of their number, the whole flock swept round repeatedly, and again settled on a low tree within twenty yards of the spot where I stood. At each discharge, though showers of them fell, the affection of

the survivors seemed to increase; for, after a few circuits, they again alighted near me, looking down on their slaughtered companions with such manifest sympathy and concern, as entirely disarmed me. They fly very much like the wild pigeon, in close, compact bodies, and with great rapidity, making a loud and outrageous screaming, not unlike that of the red headed woodpecker. Their flight is usually circuitous, with a great variety of elegant and easy serpentine meanders, as if for pleasure."

One of those which he obtained at the Big Bone Lick he carried with him on his way to Louisiana. While he traveled by water, he kept it in a rude cage on his boat, but by land he wrapped it in a silk handkerchief, and carried it in his pocket. At meal times he unwound his prisoner and fed it; when he attempted to bind it again, a quarrel usually ensued, in which the bird, though forced to yield, often gave its master severe bites. The Indians among whom he traveled were much amused at his companion. In their language

they called it "Kelinky," but they soon learned the white man's name, Polly.

At Natchez he procured a suitable cage, and hung it on a piazza. She soon called the passing flocks; they would often alight on the neighboring trees, and hold friendly chat with the prisoner. One was caught and put in the cage. Polly was delighted with her new companion. She crept close to it, as it hung by the bars of the cage, chattering to it in a low tone, as if sympathizing with its misfortune, scratched about its head and neck with her beak, and at night nestled as close as possible, often hiding her head in its feathers. The new bird died, and Polly mourned very much. A looking-glass was placed beside her, and all her fondness seemed to return. She was completely deceived; as night came on, and often by day, she would lay her head close to the image in the glass, and doze away, perfectly satisfied. During the passage from New Orleans the bird escaped from her cage, flew overboard, and was drowned.

The general color of the Carolina Parrot is green, washed with blue; the forehead and cheeks, with spots on the head, shoulders, and wings are orange; the primary wing-feathers are purplish black; the wedge-shaped tail blue along the central line. Its entire length is about twenty-one inches.

The Lories differ from the Macaws chiefly in their weaker bills and softer plumage. They are brilliantly colored; are very active and gay, even in confinement. Their home is in the Molucca Islands, whence many are carried to Eastern Asia, to be kept as pets.

As an example, we select the Purple-capped Lory, *Lorius domicellus.* The principal color of its plumage is rich scarlet; the top of the head is deep purple, nearly black on the forehead, and passing into violet at the back of the head; the upper part of the breast has a collar of yellow; the wings are green above, changing to violet on the edges; the tail feathers are scarlet near the quills, banded near the end with black, and tipped with yellow;

the thighs are azure; the beak orange-yellow. Although the tail is short, the bird is about eleven inches long.

The true Parrots are known by their short, square tails, the absence of a crest, and the toothed edges of the upper mandible.

The Grey Parrot is one of the best known. It learns easily, and talks much and distinctly. Its home is in Africa. The sailors who bring it thence delight to teach it bad language, which it never forgets, so that in spite of the most complete training it will often startle sober people by very wicked remarks. A Parrot which talks much, occasionally inserts its sentences where they are very amusing, and sometimes very apt.

A Parrot belonging to a Portuguese gentleman who had an English wife, would talk in both Portuguese and English, but would never confuse the two. If addressed in either language, it would always reply in the same. Towards dinner time it would become much excited, and cry very loud, "Sarah, lay the

cloth — want my dinner!" Its master used to punish it for talking too loud; so when his step was heard, Polly would get down upon the bottom of its cage very humbly, and laying its head to the floor, whisper in its lowest tones, "Want my dinner! Sarah, make haste — want my dinner!"

When ships of war are lying away from a wharf, or pier, ladies who wish to go on board are often taken up by what the sailors call a whip. This is an arm chair suspended by a rope; the lady sits in the chair, and the sailors hoist away. On one occasion, when the chair was half way up the ship's side, a Parrot on board suddenly called out, "Let go!" and the men, thinking it a real order, dropped the poor lady, chair and all, into the sea.

One Parrot was accustomed to imitate the cries of a dog when run over by a wagon. First, there was the short, terrified yelp, when the dog found itself in danger; then the shriek of pain, as foot or tail was caught by the wheel, and then the *Ki-i*, *Ki-i*, *Ki-i*, dying away as the

dog turned the corner and vanished up the street. Of course the bird had not many rehearsals in learning this lesson.

A Grey Parrot, mentioned by Mr. Wood, observed that her keepers were very fond of a pair of goldfinches, which they were in the habit of visiting frequently, and feeding with crumbs and seeds. Polly thought it proper to be in the fashion, so she went to her cage and brought a beak full of sopped bread to put in the nest. Presently the eggs were hatched, and Polly was delighted, but her way of showing her pleasure was so earnest, that the parent birds were frightened away. Seeing the little ones deserted, she took them into her own charge, stayed with them by night and by day, fed them, even opening their bills and thrusting food down their throats, and brought them up. When able to hop about, four would get upon her back, and the fifth on her head, and thus laden, Polly would walk gravely up and down the lawn, or now and then fly a little way, putting all the ten little wings in a flutter.

By and by the birds were fully fledged, flew away, and came back no more. Polly was disconsolate, but presently found relief in adopting the brood of a hedge sparrow. These she got somehow upon her back, and carried away to her own cage. One of the parents had been killed, perhaps by a hawk; the other Polly managed to scrape acquaintance with. At first she talked a mixed jargon of English, swearing, and bird-talk, but the language of the birds seemed to overpower the human speech, and the two shortly understood each other perfectly well.

The color of this bird is elegant ashy grey, darker above and lighter beneath; the tail is bright scarlet; the bill black.

A beautiful little Parrot, about six inches long, of a general grass-green color, is known as Swindern's Love-Bird. A pair — a single one soon droops and dies — sit lovingly side by side, caressing and frequently feeding each other in a way that looks quite like kissing.

The Cockatoos have the short, square tails,

and strong beaks of the parrots, and some rival the great size of the macaws; Their distinctive feature is a crest of elegant feathers, which the owner can raise or depress at will. A species which in other respects is classed among the parrakeets, is called the Parrakeet Cockatoo. They are generally natives of Australia and adjacent islands, dwelling in the woods, and living on seeds and fruits. They nest in decayed trees. When taken young they are easily tamed, and become quite talkative.

The Great White or Broad-crested Cockatoo, *Cacatua cristatus.* This bird is about the size of a common fowl, and it seems much larger when, excited by fear or anger, it ruffles up its feathers. Its plumage is white, tinged with rose-color; its white crest consists of long feathers arching over its head.

The Great Sulphur-crested Cockatoo, *C. galerita*, measures more than two feet in length. Its color is white, tinged about the wing covers and the sides of the tail, with yellow. Its head wears a long, broad, pointed crest of fine sul-

phur yellow. Its bill is black. The same description answers equally well for the smaller Sulphur-crested Cockatoo, *C. sulphureus*, except that the length is only about fifteen inches.

With their strong beaks these birds easily crack nuts and extract the kernel, or break the shells of snails and periwinkles, and pick out the inhabitants. One kept in a cage was fond of biting in pieces bits of wood which it could get hold of. It would anxiously watch the removal of the thread from a cotton reel, and when the empty spool was placed outside its cage, it would come down from its perch, thrust its foot between the bars, reach this way and that until it found the toy, draw it into the cage, and bite it to bits.

Sometimes the Cockatoo shows a fondness for practical joking. A lady had shown some fear of one, caused by its strong beak. The bird discovered that she was afraid, and thought it fine sport, whenever this lady came near its perch, to ruffle up its feathers, yell, and pretend to attack her, just to hear some-

"At length, the pursuer almost reaches the edge of the water, and the scared Cockatoos, with wild cries, spring into the air; at the same instant the native raises his right hand high over his shoulder, and bounding forward with his utmost speed for a few paces, to give impetus to the blow, the kiley quits his hand as if it would strike the water, but when it has almost touched the unruffled surface of the lake, it spins upward with inconceivable velocity, and with the strangest contortions. In vain the terrified Cockatoos strive to avoid it; it sweeps wildly and uncertainly through the air, and so eccentric are its motions, that it requires but a slight stretch of the imagination to fancy it endowed with life, and with fell swoops in rapid pursuit of the devoted birds, some of whom are almost certain to be brought screaming to the earth.

"But the wily savage has not yet done with them. He avails himself of the extraordinary attachment which these birds have for one another, and fastening a wounded one to a

tree, so that its cries may induce its companions to return, he watches his opportunity, by throwing his kiley or spear, to add another bird or two to the booty he has already obtained."

All things considered, the parrot does not seem to be a desirable pet. Many, it is true, are gorgeously, or, rather, gaudily attired; they are rare, and therefore costly, and, therefore, to many, valuable. But their voices are harsh; the sentences which they learn become painfully monotonous from constant repetition; the laugh which they acquire is hollow and weird. A bird in your house which can talk, laugh, scold, and swear, does not seem to be a friend and companion, but rather an imp, a witch, familiar with evil spirits, if not actually possessed by them. Anecdotes may be multiplied concerning their queer sayings and doings, but they almost always describe some which lived long ago, or far away. A quiet man, studiously disposed, who unfortunately lives next door to a thorough-bred talker, soon

comes to wish every member of the family back in Africa, or Australia, or some equally remote land, with some Mede-and-Persian law against their leaving home. How much more lovable and lovely our native birds, whose graceful forms, beautiful plumage, and jubilant singing, enlivens our forest, prairie, and village homes!

THE WHITE-THROATED SPARROW. *Zonotrichia albicollis.*

About Our Dickie.

YOU never heard of our Dickie? Quite likely. There had been many Dickies before, and there are many left, but none were, or are, like *Our* Dickie. When you hear his story, I am sure you will agree with me that Our Dickie was a rare little fellow. This is the story:

But first you must know where we live, and how we came to have a Dickie. Now our home is in a homely — that is, homelike — old house, that nestles in the shadow of some grand oak trees on the high shore of Lake Michigan. In winter, the winds moan among the naked, shivering branches of the gray old trees, but in

summer the sunshine peeps cheerily through their gnarled tops, and dances gaily on the green turf below, while the birds nestle in their thick foliage; the woodpeckers rattle at the dry limbs, and look out from their holes in the mossy trunks; the vireos whistle from their sprays; the blue-birds, and yellow-birds, and flame-colored orioles flash hither and thither through their branches; the robins build in their forks; the jays scream and scold about the fallen acorns; the nuthatches and the wrens creep up and down and athwart the bark, and the sparrows are every where at home. Here, if nowhere else, the birds find an asylum. The children love to greet their coming, and to watch their quaint ways. No noise of gun, no stone or arrow, ever disturbs their work.

From the rear of the garden the ground falls away fifty feet, as steep as sand and clay will stand, down to the pebbly margin of the lake; and here, in the face of the steep bank, in the tufts of sedge, and thickets of willow, in great groves of growing hemp, and clumps of thistles

and golden-rod, the birds are still at home. The bank-swallows dig holes in the earth; the kingfisher sits and watches his finny prey; the sparrows make their nests; while in the waters below the wild ducks paddle and dive, and above, the gulls spread their white and gleaming sails.

One July day, while we were searching the bank for some peculiar plants, a sparrow fluttered away from us in great apparent distress. She seemed to be hurt; as if a leg or wing, we could not tell which, was badly wounded, and so one could almost put his hand on her as she floundered away through the weeds. Almost, but never quite; pretty soon, when she had drawn us away a few rods, suddenly she was healed; she sat on a twig, bobbed this way and that, whistled a chirp or two, and then flew away as contentedly as possible.

Then we knew what a pious fraud the little actor had been playing upon us. Somewhere in that bunch of golden-rod and rank grass, she had hidden her nest, and by all this fluttering

show of broken wing she had hoped to entice us away from her darlings, to avert the great peril which threatened them. And so, having, as she thought, finished the deception, she flew away, while we went back to the bush, and found out her secret.

Her house she had builded of grass, and cushioned with hair. It was set about two feet from the ground, among the rank weeds, just where she could peep out between the leaves and twigs, and observe all who passed or approached her home. In the nest were three tiny birds — one little, one less, one least of all — with one addled egg. From this it appeared that the sparrow, like the canary, begins to sit as soon as the first egg is laid. The four eggs, laid at intervals of one or two days, are hatched in succession, and birds of several sizes are found in the same nest. Thus a week's time is saved.

The little birds were merely wads of red meat, covered with folds of wrinkled skin; they had sprawling, useless legs, and long, thin

necks, which carried each a round, bald head, with blind bunches where eyes should be, and beaks that gaped voraciously. Feathers were not; a few scattered hairs, together with the beginnings of quills at the edges of the wings, were the only clothing of these naked bodies. As we jarred the bush, the three necks thrust up three yawning mouths, waited an instant, and then sank down again; another jar brought them up again, but we had nothing to put in them, and so went away, not failing to observe the anxious mother, who had returned, and was watching us in great tribulation on a near bush.

When we were safely off, she flew to the nest, and, as I imagine, concluded that we were not very dangerous dragons, for at subsequent visits, she merely flew to the bush, without repeating the fiction of the broken wing. Two or three times next day I visited the nest and fed the little eager mouths with bits of moistened bread, which the birds seemed to swallow with intense satisfaction, while the mother

made no special demonstration of alarm. I began to think I had established a pleasant intimacy with the family.

Late the third day I visited my new friends, and then things were in sad confusion. Some stray cow had eaten away all the cover of weeds, and left the brood without shelter under the scalding rays of the sun. Worse than all, the mother was no where to be seen, and the hungry mouths screamed for food. I waited and watched, but she came no more. I concluded that she must have been killed, for I could hardly believe that she had been frightened away permanently, so I took nest and birds and carried them to the chamber where I was writing these bird-sketches for my little friends.

Here, then, was a task before me, to rear up this little deserted family. The first thing was to find suitable food; but one can hardly go astray in giving bread moistened with milk to young birds. The first thing which I observed was the utter helplessness of the little crea-

tures. They seemed to have no sense save that of feeling, or, more exactly, of motion. Their eyes were quite closed; no noise, whistle, or chirp which I made aroused them, but the slightest jar given to the nest, or to the table on which it stood, brought up the three heads in an instant, with mouths open wide, and uttering a hissing kind of squeak. It was not enough to put the crumbs of bread into their mouths. The base of the tongue has a sort of barb, like that of a fish-hook, which projects back into the throat, and a pair of similar barbs are in the roof of the mouth. If the food were not thrust so far into the throat as to be caught by these barbs, it was thrown away with a flirt. This did not seem to be because the bird did not like the food, for it swallowed it eagerly when pushed farther into its throat, unless it had taken enough; then it would throw it away.

They ate every half hour during the day, if food was given so often; if left two hours, the heads were all up and screaming. After twi-

light they were quiet until early dawn, and then there was no peace until somebody got up and fed them.

In a few days, the largest one, which we had called DICKIE, began to get his eyes open, and to look about. He soon learned the whistle which was given when he was fed, and gave an answering chirp — *tsip, tsip.* One day, after his allowance of crumbs, he still opened his mouth and cried, but yet threw the bread away. In doubt as to what he wanted, I dipped my finger into water which stood by, and let the drop fall into his throat. It was just the thing; the drop was eagerly swallowed, and the open beak screamed for more. Two or three drops were enough, and the bird nestled away, satisfied.

Was this want natural, or was it caused by the peculiar nature of its food? There seemed to be moisture enough in the milk with which the bread was soaked. Do the old birds bring water to their young when in the nest? This nest was near enough to water for such a purpose; and any where a supply could be had

from dew drops; but I have never seen any statement of naturalists to this point, and had always supposed such a carrying of water impossible. Certain it is, that before my birds were able to feed themselves, I gave them, once or twice a day, two or three drops of water, which they swallowed greedily, and for which they clamored, if by chance it was forgotten.

When I found small caterpillars, I fed them to my birds. They ate them gladly, but I could not spare the time to search for that kind of diet, and quite likely for this reason, the youngest died in two or three days, and the next at the end of the second week. Dickie seemed perfectly healthy; he grew rapidly, and soon was covered with feathers.

From the presence of the egg in the nest, and the sizes of the birds, I supposed that Dickie had been hatched about a week when I adopted the family, so he must have been about three weeks old when I found him sprawling on the floor, and scolding most earnestly. Thinking that he had fallen out of the

nest by chance, I put him back again, but soon found that he was no longer to be cribbed or confined in any such limited quarters. The nest was too small for his expanding ideas, and he had started to see the world. Afraid to have him loose, I put him in an old cage, but that did not suit at all; he went out between the wires without the slightest trouble. So I was forced to let him wander about the room as he pleased, and here began our more intimate and amusing acquaintance. He was not pretty as birds go; he was only little, brown, and ragged; he had no song, except his constant chirp, but he became a most entertaining companion.

When Dickie was five weeks old, he was tolerably well feathered, could perch securely, and fly about the room. He would feed himself if quite hungry, but much preferred to be fed. His favorite perch was a round of the chair in which I sat writing; to this place he would retire after a full meal, and sit for an hour, or until he was hungry again. Other places of

about equal merit were my knee or my shoulder; these he sometimes seemed to prefer, because warm to his feet, and here he would sit, his feathers raised into a puffy ball, his crest up, and himself looking about as if the world, his oyster, were already opened, and he thoroughly happy with the contents.

Wherever he was, by day or night, he always answered my call — the chirp that I used when feeding him — by his own cheerful chirp; a second or third call was sure to bring him hopping or flying to my finger. In the night, when asleep, with his head under his wing, he answered my call with a very gentle, sleepy chirrup, but without taking his beak from under the feathers. When he had been left alone, his joy at the return of a friend was without bounds. His chirp answered the first step on the stair, and when the door opened, he came flying from even the most distant corner of the room, and alighted on the hand or the head of his visitor with screams of delight.

Strangers, particularly children, he was a

little afraid of, and would retire to his master, but he soon made acquaintance. To take him up, one had only to put his finger before him, and he would instantly step on it; we used to amuse ourselves by making him walk up stairs from finger to finger.

He was much attracted by writing. He followed the pen or pencil continually from side to side of the paper, pecking at the point, and often trying to pick the letters off the paper. A pin, in a cushion, or between the leaves of a book, afforded him much diversion; he would work patiently many minutes to pull it out. Often, as he ran about over my writing, we had mock skirmishes together. The pencil would be laid gently on his toes; this he would answer by two or three sharp pats with the disturbed foot, a retreat, and then a quick return to the sport — for such he deemed it — never showing any sign of fear, or distrust.

He would allow no approach from behind; quick as a flash he would face about, and confront his pursuer. So, too, while he would at

any time mount the finger, if one tried to cover him with the open hand, just as the hand was about to close upon him, he usually stepped aside, saying by his saucy air, "no you don't."

At night, he usually retired to the open cage, and placed himself on its highest perch, under the shelter of its roof. If by accident the cage was shut, he mounted its ridge. One night, at bed time, he was not to be found. Next morning early he was clamorous for his breakfast. He had slipped out through the blind, and spent the night in an oak tree, but was glad to come back again. Usually the window and blind near my writing desk were open, and he hopped about the sill, seldom offering to go out, and always ready to return when called.

His food continued to be bread and milk, with occasionally some boiled egg; rice was acceptable, and rice pudding peculiarly so. Insects of any kind he devoured eagerly. Flies he helped himself to. A dragon-fly busied him for a long time. He broke off bit by bit,

thumped away at the head and thorax until he had broken their hard shells, and could swallow them, and rejected the wings as too husky for his stomach. Spiders were a luxury. I took him in my hand to a place in the open air where the spiders had woven their geometrical webs over a long balustrade, and even while a close prisoner, he cleared the whole railing.

In early autumn, my duties calling me to the city, I took Dickie with me. He at once made himself at home in his new quarters. During the day I left him in the cage; on my return at night, I gave him the freedom of the room. The confinement did not seem to annoy him, but his delight at companionship was evident.

It was not convenient, in our new home, to supply him with insects, and his health suffered. By day he was sprightly enough, but in the evening, as soon as he went to sleep, he fell from his perch. Then he would pick himself up in great astonishment, and immediately climb to the topmost perch in the cage, to go to sleep and fall again. I took out the higher

perches, but the low ones did not satisfy; he climbed to the top and held on the wires. Outside the cage, so long as there was a light in the room, the only place where he was content was on the top of my head; the shoulder would not do, because the head was higher.

One night, just before putting out my light, I placed Dickie on a stand within reach of the bed. When it was dark, I spoke to him and he answered; I put out my hand and touched him. Instantly he sprang from his place and fell on the floor. I spoke to him again to reassure him, and felt for him in the darkness, in order to put him back again on the stand, but the instant I touched him, with a terribly frightened scream, such as I had never before heard from him, he fled away. He would not answer my call, but when the light was brought, with a great cry he flew to my hand, overjoyed at his escape from the terrible unknown danger which had come so near him in the darkness.

Up to this time he had always taken whatever I had offered him to eat, and if, by way

of joke, I had given him a bit of stick, he simply threw it away, as if saying, "You know I can't eat that!" As advised by some writer on bird-keeping, I mixed a quantity of pepper with his food. The first morsel he took as a matter of course, but the turn of his head said, "What vile stuff is that?" The next he took, tasted, and threw away. The next he would not touch, so I had to open his beak and give his medicine by force. He did not resent it particularly, and took the drops of water I offered him kindly; but next morning, when I brought his breakfast, his manner said quite plainly, "You cheated me before, and I can't trust you now!" However, hunger was on my side; he ventured finally to try a crumb, and finding that all right, forgave the affront, and went on with his meal.

One evening, while busy, I heard him fall from his perch into his bathing dish, but as this had happened before without harm, I thought no more of it; afterward, not hearing the usual flutter which he made in shaking the

water from his feathers, I went to his cage, and found the bird dead in his bath. One could not help sorrow for so entertaining a pet, though of no more consequence than a sparrow. In manifold cerements of soft paper we laid him away, and put the vacant cage out of sight.

And now comes in the supernatural. It might, perhaps, be expected that a bird so remarkable while living should make some ghostly manifestation after so tragic a fate, yet who would suppose that the ghost of a sparrow would revisit the scene where he had chirped out his little life? As has been related, whenever any one came to the room where Dickie was alone, he made great show of gladness, chirping, and if free, flying to the head or hand of his visitor. So, after he was dead, as we opened the door, and stepped into the room, the same familiar chirp was often heard. Several persons observed it. It did not come from the door, for we oiled the hinges, and the door opened noiselessly. It was never heard when

we left the room, but only occasionally, as we entered, and usually when we were not thinking of it, or expecting it. It was no night-walking ghost; it came honestly, in broad daylight.

Alas, for our veritable ghost story! A few weeks passed, and we discovered that one board, when trod on in a peculiar place before the door, uttered a sharp creak, quite like poor dead Dickie's chirp. The precise place which made the sound was where one might step when coming into the room, but not on going out. The mystery had descended to a very commonplace fact, but I make no doubt that Dickie's ghost was as veritable an existence as any of those more pretentious goblins which have,

> "in complete steel,
> Revisited the glimpses of the moon,
> Making night hideous."

The sprightly, playful, affectionate nature of my little bird, his thorough domestication, and

trustful confidence, endeared him to us all. Such is the story of OUR DICKIE.

THE family of Sparrows contains many species, and is abundant on both sides of the Atlantic. The English Sparrow, the only one which has found his way into general literature, is quite different from our American varieties, both in form and in habits. His shape is stouter, and his coloring, a mixture of white, brown, gray, and black, not easily described, is more varied. He gathers in large flocks, is equally at home in country or town, and alike fearless in the presence of man, or of larger birds and quadrupeds. When the Crystal Palace was built in Hyde Park, London, in 1851, the sparrows which swarmed into the enclosure through the ventilators gave very serious trouble, and were finally banished by a few sparrow hawks.

The Sparrows breed very fast, raising several broods in a single season. In a province of France they were all destroyed by order of

government; the next year even the green trees were killed by caterpillars. Besides great numbers of worms and grubs, the Sparrows eat the seeds of many noxious plants, as dandelion, and thistle. These valuable qualities are shared by most of our small birds, and all richly deserve protection. A few years since, a number of English Sparrows were imported for the Central Park in New York. They at once settled themselves in their new quarters, and have since so multiplied as to be common in all that part of the city and in adjacent towns.

Of American Sparrows, which children call "chip-birds," there are many species, which differ so little that only expert naturalists can distinguish them.

INSECTS.

ANTS AT WORK.

About Ants.

BRANCH — *Articulata* — Consisting of rings, or joints.

CLASS — *Insects* — Having bodies divided into two or three distinct parts.

ORDER — *Hymenoptera* — Having membranous wings.

FAMILY — *Formicaria* — Ant family.

DO you ever find yourself, some dreamy summer day, with nothing to do? The hot, dense rays of the July sun scorch the dry grass, glow in the burning sand, and almost hiss in the water of the idle stream. The birds hide in the dense thickets, the cattle pant in the shade, and the very dog wishes he could take his jacket off. The strawberry leaves crisp in the heat, and rest upon

the ground; the corn curls its green blades, and turns blue; the portulaccas shut their cups; the pansies hang their heads; even the giant sunflower droops his broad leaves, and the cabbages perspire. It is too warm to work, or to read, or to play. The boy has exhausted all his own plans for fun, and in despair asks his mother, "What shall I do?"

I'll tell you what to do. Find an ant-hill in some shady place, where the sun will not burn your back, lie down upon your face, and watch it. You have passed such a thousand times, without knowing what curious things could be seen there. The little fellows worked all the morning, and brought up out of that hole in the middle, all the grains of sand that you see piled around in a tiny, circular fortress. One by one they brought them out and laid them in their places. Now they are thoroughly warmed by the sun, and they are carrying them back again, into the rooms which they have excavated below. If there is a flat stone near, turn it over, and you will quite likely

find a much busier crowd. A large chamber, with many winding passages running hither and thither, and connecting with each other, and with other passages underneath, has been made, like the public square and the thronged streets of an old fashioned city. It is not like the exact, right-angled, stiff, modern town, but the lanes turn in and out, and yet go on with persevering directness towards some particular spot which was not down in the original plan, although a point of much consequence. Scattered all along the thoroughfares of this stone-canopied town, and quite plenty in the grand square, are many long, round, white somethings, a little like grains of wheat. People have mistaken these things for the food of the ants, and so have written,

"The little ant, for one poor *grain*,
Doth tug, and toil, and strive."

But the ants lay up no food. They need none; for as soon as the hard frosts of autumn chill them, they lie down to sleep till the spring

wakes them again. If they did lay up food, it would not be grain, for the ant can no more eat grain than a man can eat gold, and the ant is not so big a fool as to hoard what he can not use.

Others have thought that these little white sacks are the eggs of the ants; but eggs do not grow, and surely ants can not lay eggs that are larger than themselves. Whatever they are, the ants evidently think them very valuable. Away they go, over the clumps of earth, and through the tiny streets, as if to see what has happened, and estimate the damage. They don't quite understand it, but they are agreed that one thing is to be done forthwith — these precious little sacks must be carried in, out of danger. So each grasps the nearest, and drags it away to the hole in the centre, the gateway of the inner town, where you see the throng coming out. The sack is larger than the ant, but he seizes it resolutely, and raises it over his head. Away he creeps, but it strikes that block of sand at the street corner, and

he can not lift it over. He lays it down and pulls the end of it round; that obstacle is past, but another is beyond. A second worker comes, and the two, by pulling at one end and lifting at the other, have brought it to the gate. Surely they can not get it through that narrow and crooked passage. One has gone below, and the sack shuts him from sight. The other tugs and pulls. It will not move. Yes, it does; see that end rise in the air; now it sinks in the hole; now it is out of sight. But here comes another, and another. All are hurrying to the numerous stairways to the city below, and in a short time all will have vanished.

These sacks contain the young ants. The eggs were laid by the queen, and hatched by the warmth of the hot grains of sand. The grubs were fed, and grew, and finally shut themselves up in the sacks, as the caterpillar spins a cocoon, or the beetle-grub sheds his coat and becomes a chrysalis. Then the ants take great care of these sacks. They

are very precious to them because they contain their children. If the air is damp and cold, or the rain falls, they carry them down into the lower rooms, and keep them warm. If the sun is warm and bright, they are brought where the warmth may be felt, without making them too dry. If they happen to be exposed, we have seen how they are hurried to a place of safety. If you should carefully dig down into the earth, you would find the underground city very extensive, the long, winding galleries lying tier after tier beneath each other, and leading to large apartments, where the ants and their children find room.

Three kinds of ants come out of these cocoon-sacks. There are males, which have four wings; females, which are much larger, and have two wings; and a third kind, called workers, or nurse-ants, which have no wings. After midsummer the several kinds may often be seen very busy about an ant hill, the winged ants trying to get away, and the workers bringing them back as often as they can find them.

The males seem to be worthless fellows, and soon disappear. They have no sting to protect themselves with, and no jaws to help them get a living.

Some of the females are caught by the workers, and taken back to the nest. Others wander away with a few followers and found new colonies, while others stray away by themselves, going out into the wide world alone. When one alights, she examines the new land which she has discovered, to see if it is fit for a home. If she is satisfied, she turns back her head, bites off her wings at the shoulders, and settles down for life. Her wings carried her from her mother's house to her new home, and henceforth her journeying is ended. Then she begins to hollow out a chamber for herself. Even if she has workers with her, she continues to toil until she has laid eggs; then she is recognized and honored as a queen. If alone, she has to continue her toil until the young from her own eggs make a colony about her. The grubs, when hatched, are fed by the nurse-ants, or by the

mother, with food prepared in the stomach, and the solitary insect has much to do, to find food for herself and her hungry family.

Ants eat various substances, particularly such as are juicy, or contain sugar. They kill and eat weaker insects, and they are very fond of ripe, sweet fruit. One may be sure they will always choose the best. If the pioneers can not eat the whole of some plunder which they have found, they carry away what they can, and then bring back an army to carry off the rest. They are very fond of a substance called honey-dew. Ants are often seen running up and down the trunks of trees, even when there is no fruit on the tree to tempt them. As the trees which they visit are often sickly, they are supposed to do some injury. They are not at all to blame, but are only going to their farms to look after their cattle. The leaves and tender twigs of these trees will be found to be covered with small, pale-green insects, called *Aphides*, or Plant-lice. They are often very closely packed upon the leaf or stem, and they

do harm by sucking up the juices of the growing plant. The ant comes up the tree to his dairy farm, and strokes one of the green lice with his feeler; the louse gives out a single drop of clear liquid, which the ant drinks. Then he goes to the next, and so on, milking his cows, or gathering honey-dew. When he has enough, he goes back to his work, digging, building, or feeding the young ants.

The working ant does a great deal of work in a day. M. Huber, a French naturalist, gives an account of a single day's work of one ant. The insect first dug in the earth a groove or road, about a quarter of an inch deep and four inches long. The dirt which he took out, he kneaded into pellets, and placed on each side of his road, to make a wall. When this road was finished, very smooth and straight, he found that another was wanted, and he made that in the same manner, and about the same size. A man, to have done as much in proportion to his size, must have dug two ditches, each four and a half feet deep, and seventy-two

the wood through which they cut is all colored black, as if the fire had passed through it.

When these black carpenters get into a dwelling, they cause a deal of trouble. They make themselves at home in the very woodwork of the house. They gnaw a way into any wooden box which they wish to explore, and will find the least crevice into the sugar-box or cake-jar. The prudent housewife puts her pot of sweetmeats in a pan of water, but if the ants know what the jar contains, they will find a way to it, even if they crawl upon the shelf above, and drop down upon it. The family may be almost exterminated, and yet, if two or three be left, with all the resources of the nest at their command, in a little time the plagues are as thick as ever. Moreover, they bite.

Some tribes of Ants are very warlike, and they make war to capture the workers of other tribes, and obtain slaves for their own communities. It is said that the kidnappers are always pale or red Ants, and that the captured slaves are black. When the red Ants are about to

make a foray, they send scouts to explore the ground, who afterwards return and report their success. They then march forth in regular armies. The assailed town pours out its inhabitants, and the fight begins. Head to head, foot to foot, jaw to jaw, the sable warriors defend their homes and their children, but in vain. The victory is always with the invaders. They do not drive out their conquered foes, but they break into their homes and carry away the cocoons of the workers. The red ants return in perfect order to their own city, bearing with them their living burdens. They treat the plundered young with the same care they give their own, and the ants produced from the stolen cocoons seem to work with abundant energy and good will. The inhabitants of the besieged city, knowing what result will follow the fight, often carry away many of their young. They take them to the tops of the grass stems, and hide them amid the foliage of other plants. When the raid is over, they bring them back to the nest again. Several

kinds of ants practice this kind of warfare, and the results are too well attested by careful observers to admit of doubt.

Although there are many kinds, and countless numbers of Ants in the cooler countries of the temperate zone, they are far surpassed in number, in size, and in venomous power, by those found in the hot lands of the torrid zone. Here all kinds of reptile and of insect life seem to be extravagantly developed, and the ants are often so numerous and so powerful as to drive away every other living thing.

The Saüba or Coushie Ant, *Œcodoma cephalotes*, lives in South America. It is often called the Parasol Ant. Large columns may be seen marching along, each carrying in its jaws, and over its head, a round piece of leaf, about the size of a dime. Many suppose that this is actually carried to keep off the heat of the sun; but the fact is that they use the leaves to thatch the roofs of their houses, and to keep the loose earth from falling in. They choose the leaves of cultivated trees, as the orange and

the coffee. When they attack a tree, they strip it of foliage so entirely, that it often dies. Then they march away with their plunder, and fling it on the ground, at the nest. Another party of workers take up the pieces, and put them upon the roof, covering them with dirt. These domed houses are wonderfully large, measuring sometimes two feet in height, and forty feet in diameter. Their underground cities are on even a larger scale. The smoke of burning sulphur blown into one opening has been found to come out at another, more than two hundred feet away.

There are three kinds of these ants: the winged, the large headed — sometimes called soldiers, and the workers. The large headed are also of two sorts: one kind has a smooth helmet, covered with horny substance, which one can almost see through, and the other wears a dark helmet, covered with hairs. The business of these large-heads is not very well understood. The smooth helmets seem to do nothing but walk about. They do not fight;

they do not work; they do not appear to overlook those which do work. The hairy-helmets are not known to do any more. If the top of one of the mounds be taken off, a circular well will be found in the centre, into which a stick three or four feet long may be thrust, without touching bottom. Presently some of these hairy-headed fellows, each wearing one eye in the middle of its forehead, like a fabled Cyclops, will come slowly up the smooth sides of the well, to see what is wanted. But they are not very pugnacious, and may easily be caught by the fingers.

The winged ants are the perfect males and females. They come out a little after midsummer, that is in February. The females have bodies about as large as hornets, and spread their wings nearly two inches. The males are much smaller. Although hosts pour out of the nests, few remain after a day, for the birds and insect eating animals have devoured most of them. Those which escape found new colonies in spite of all the dangers which threaten

to destroy them; even the art of man can not conquer them.

Among the South American Ants are several species which are classed together, and called Foraging Ants. They belong to the genus *Eciton*. They have been confounded with the Saüba Ants, just described, but their habits are quite different. The real Foraging Ant, *E. drepanephora*, is very annoying, and very useful. These insects go out from their cities in immense armies, not very broad, but often a hundred yards long. Officers march beside the column, very busy keeping their own portion of the line in order. There is an officer to about twenty privates; their white heads nodding up and down make them quite conspicuous. The pittas, or ant thrushes, always accompany these armies, picking up the Ants for their own food; but still the band goes marching on. The people know that the Ants are on the war path, and make every preparation for their reception.

In those countries, insects of every kind get

into the houses, and multiply to an extent which almost drives the inhabitants from their homes. By day they are a trouble, and by night a pest. They bite, and suck, and scratch, and sting. They crawl over the food; they hide in the bed; they fly into the lamp, and then whirl on the table; they creep into the ink; they emit horrible smells. There are centipedes which sting, and scorpions which sting. There are cockroaches of powerful size and smell, and of insatiable appetite. As for snakes and lizards, and other creeping things, they are too common to be noticed. It is of no use to fight. Your enemies are legions of numbers innumerable. But when the Foraging Ants come, the case is altered, for nothing can stand their attack. When the pittas come about, the people open every box and drawer in the house, so as to allow the ants to explore every crevice, and then they vacate the premises.

"Presently a few scouts, which form the vanguard of the grand army, approach, and seem

to inspect the house, to see if it is worthy of a visit. The long column then pours in and disperses over the dwelling. They enter every crevice, and speedily haul out any unfortunate creature which is hidden therein. Great cockroaches are dragged unwillingly away, being pulled in front by four or five ants, and pushed from behind by as many more. The rats and mice speedily succumb to the onslaught of their myriad foes, the snakes and the lizards fare no better, and even the formidable weapons of the centipedes and scorpions are overcome.

"In a wonderfully short time the Foraging Ants have done their work, the turmoil gradually ceases, the scattered parties again form into line, and the army moves out of the house, carrying its spoils in triumph. When the inhabitants return, they find every intruder gone, and to their great comfort may move about without treading on some unfortunate creature, or put on their shoes without knocking them on the floor to shake out a scorpion or a centipede."

But those who are accustomed to the country are careful to keep out of the way. If a man should happen to cross the column, the ants at once dash at him, climb up his legs, and bite with their powerful and poisonous jaws. His only safety is in running away until the main army is too far off to renew the attack, and then destroying those which he has brought with him. This is not easy, for the Ants have long, hooked jaws, and bite so fiercely that they may be pulled away piecemeal, leaving the jaws in the wound to be picked out separately.

Another species, *E. prædator*, marches in broad, solid mass. It is a little creature, like our common red ant, but much brighter colored, making the trunk of a tree upon which many climb look as if smeared with a blood-red liquid.

This little red ant is exceedingly venomous: its bite brings a quenchless, burning sensation, whence the Brazilians call it "fire ant." The South American Indians require their young men to undergo the ordeal of the Tocan-

deiros, or fire-ants, before they can be known as warriors, or recognized as braves. A pair of mittens are made of the bark of the palm tree, long enough to cover the arms above the elbows, and are filled with the Tocandeiros. The candidate for warlike honor must put his hands into these bags of living fire, and wear them while he makes the round of the village, and dances a jig at every pause. During this march he must wear a smiling face, and chant a kind of song so loud as to be heard above all the noise his companions may make upon rude horns and drums. He must not, by word, action, or look, show any sign of the torture which he endures; if he should, he will be the ridicule of his tribe, and even the maidens will refuse to know him. When the round of the village is complete, he must pause before the chief with swifter dance, and louder chant, until he falls from exhaustion, and the burning gauntlets are removed. Then he has won his right to carry a spear with his tribe.

A species, *E. legionis*, attacks the nests of

some of the large burrowing ants. They arrange themselves for this purpose into two bands; one set dig into the ground and take out pellets of earth, while the others receive the pellets and carry them away. They will thus sink a hole ten or twelve inches, and always succeed in opening the nest. The materials they pull to pieces and carry home, as well as the inmates. The community is in wonderful discipline. Each ant knows his place, and attends to his business.

The species *E. erratica*, is blind. The eyes of the other varieties are very small, but in the Blind Ant they are absolutely wanting, not showing even a trace. They have, however, some means of knowing light from darkness, for they are very uneasy when brought into the light.

They are wonderful builders, constructing long galleries through which they travel. If a gallery be broken into, the soldiers are seen slowly coming out, and opening their large jaws as if they would bite something. If not

disturbed, they retire into the gallery, and soon the workers come and repair the breach. These galleries are built upon the surface of the earth, and do not penetrate the soil.

Some Ants make their nests in trees, hanging them from the boughs, like the wasps. One of these carries its abdomen in the air, hanging over its back, and has acquired the uncouth name *Crematogaster*, or "hanging-belly." Another is called by travelers the Green Ant, *Œcophylla virescens*. The name signifies a house and a leaf, and is given because it makes its hanging nest of dried leaves. When disturbed, the Ants come pattering down upon the man below like rain-drops, seeking for spots which they can wound, and having a special faculty for finding their way down the neck.

A tribe of Ants somewhat similar to the *Ecitons* of South America, is found in Africa, and is called Bashi Kouay, or Driver Ant, *Anomma arcens*. It is the dread of all animals, from the leopard to the smallest insect. It

marches through the forest in lines about two inches broad, and of incredible length. One writer asserts that he has seen a column of these insects continue passing a single point, at good speed, for twelve hours. Officers march along the line and maintain order. If the advance guard come to an open place, not shaded by trees, they build a covered way, or tunnel, of dirt moistened with their saliva. If there are sticks and leaves on the ground, they fill up only the spaces which are exposed, for the direct rays of the sun kill them very quickly. If a stream crosses their path, they make a bridge of themselves, over which the whole pass. First a single Ant swings himself from the branch of a tree which overhangs the water. Then another crawls over him, and hangs from his feet. Others follow until a living chain is formed which reaches to the water, and rests upon it. Then the wind or the current wafts the free end of the chain about until it touches the opposite shore, and the crossing is complete. If one chain bridge

is insufficient, others are made alongside. It is asserted that the bridge is even made tubular, and that the army marches through it.

When the Ants get hungry, the long line stops marching by the flank, as soldiers would say, that is, following each other in line, and moves like an army in line of battle, devouring every thing in its way. The black men run for their lives. In a very short time a mouse, a dog, a leopard, or even a deer, is overrun, killed, eaten, and only the bones are left. When they enter a house, they clear it of every living thing. If a fowl is the victim, they dig out the feathers by the roots, and then pull the flesh to pieces, fastening their strong pincers into it, and never failing to bring away the piece.

A white hunter killed an antelope, and brought it to a native village. In the night he felt himself terribly bitten, and roused his attendants. The whole village was attacked by a column of the Bashi Kouay, which was attracted by the smell of the meat. The

natives protected themselves by making circles of fire and standing inside. Before morning the insects had eaten every thing they could get, and had traveled on.

During the abundant tropical rains the Drivers run together and form themselves into balls, varying in size, but usually about as large as those used in the game of ball. These balls of ants float upon the water until the land appears again, and the insects can go about their business. The natives try to destroy them by making fires over and about their nests. This does not accomplish much, for the cunning ants escape before the heat becomes too great, and will be found hanging in festoons upon the neighboring trees, and crossing from one to another by their chain bridges.

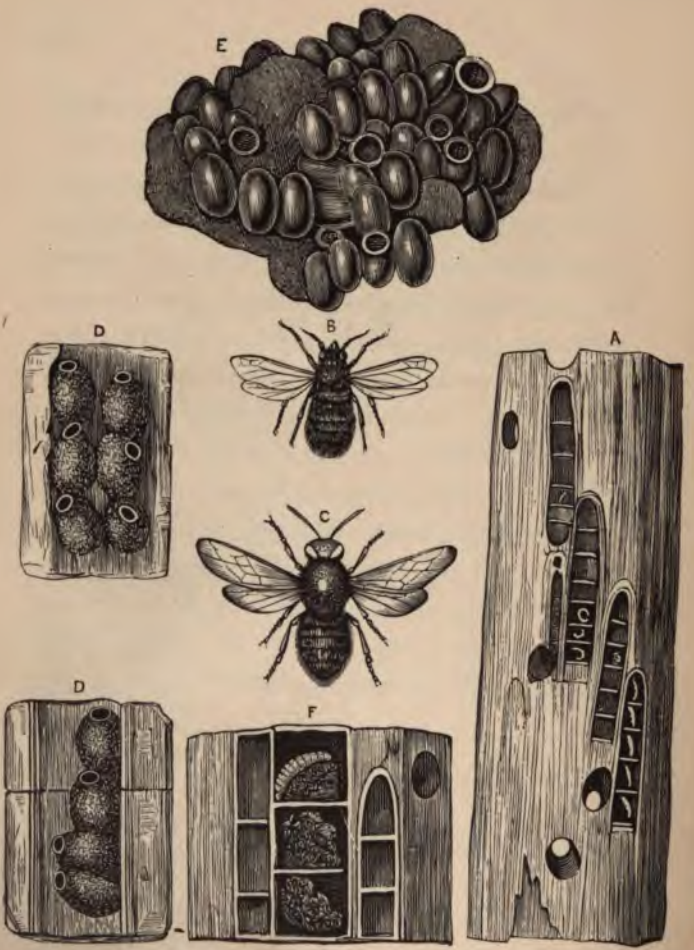
These ants are black, with a tinge of red. They have enormous heads, equaling about one third of their entire length. The jaws are sharply curved, and cross each other when closed, so that if the ant has fixed itself, its hold can not be loosened unless the jaws are

opened. It has no appearance of external eyes.

Dr. Lincecum has observed an Ant in Texas, which has been called the Agricultural Ant, *Atta malefaciens*. When this species has fixed its home in good dry ground, it bores a central hole, about which it raises the surface perhaps six inches, making a low mound, which gently slopes to the outer edge. If the spot be wet, the mound is raised higher, and is even fifteen or twenty inches high. The space about the mound is carefully cleaned and smoothed like a pavement. Nothing is allowed to grow in this circle, two or three feet from the centre, except a single species of grass. This grass the ants tend with the greatest care, cutting away the weeds within and about it. It thrives under their culture, and bears a crop of seed which resembles, under the microscope, miniature rice. When ripe, it is carefully harvested, and carried into the cells, where it is cleaned of the chaff, and packed away. If the grain gets moist in damp weather, it is taken out and

dried on the first fair day, and the sound kernels are carried back again; those which have sprouted are thrown away. Since men have made farms in that country, and the cattle have eaten down the ant-rice, thus spoiling their crop, the ants have either abandoned the pastures, or those communities have perished. They may be found in places where the cattle can not get at their crop of grain.

Dr. Lincecum is confident, after twelve years observation, that these ants plant the grain, take care of it, harvest it, and keep seed for another sowing. Each year the crop of ant-rice is found growing about their cities, and not a blade of any other green thing can be found within twelve inches of this grain.



CARPENTER AND MASON BEES, AND THEIR CELLS.

B. Mason Bee; D. Cells of the Mason Bee; C. Carpenter Bee; A. F. Cells of Carpenter Bee; E. Comb of Humble Bees.

About Bees.

ARTICULATA.—INSECTA.

ORDER—*Hymenoptera*—Membrane-winged.

FAMILY—*Apida*—Bee family.

IN the summer days, among the white clover heads, we find a bright, busy, buzzing Bee. He runs quickly over the round white bouquet, and thrusts his long tongue deep into every floweret. He tastes of each, and then, with cheery hum, visits another and another flower. In a little time he has gathered his sweet freight. He rises in the air, circles about for an instant, and then dashes away in the straightest of bee-lines to his home.

Another is searching the larkspur. A third is working at the snapdragon, the "frogs-mouth" of the children. Now he kicks against the lower lip of the gay corolla. It opens, and in he goes, while the door shuts after him. Presently it opens again, the Bee creeps out, goes to another, and vanishes in that. A fourth is making the round of the cucumber vines. Down he goes into the golden cup, round the sculptured pillar at the bottom, and out again, dusty with yellow pollen. He descends into a second cup, and as he rubs his way round that column, carved with a different device, he leaves a little of the golden dust to give vitality to the tiny cucumber at the base of the flower. If there were no Bees, the cucumbers and squashes would not grow.

Hear the gentle hum among the pale, graceful clusters of locust blossoms, which burden the air with their oppressive sweetness. The buckwheat field resounds with the busy murmur. They visit the honeysuckles and the morning-glories, the clematis and the violets,

the lilies, the pea-blossoms, the scarlet-runners, and all the multitude of flowers that provide honey in their fragrant cups.

Before that fellow which explored the cucumber blossoms went home, he rested on a twig and scraped himself all over with his feet. He cleaned off every particle of the yellow pollen which had gathered upon his velvet coat, and put his jacket in the nicest order. Little dandy, is he? Not at all. He is only neat; and besides, the dust was partly what he came for. He kneaded it together, rolled it up carefully in a ball, and tucked it away in his trousers pocket. Not just that, either, but in a hollow inside his thigh, made on purpose for that kind of load, and lined with bristly hairs to keep the little yellow packet from falling out. One may often be seen with his two thighs loaded down, while he is still gathering his supply of honey.

Behind the house, under a little shed in the thicket of locusts and cinnamon roses, is the Bee's home. When his ancestors took care of

themselves, they made their comb and stored their honey in the hollow of some old tree; they ate it themselves, unless the bears climbed the tree and took a share. Now the careful farmer provides a snug, clean box for each swarm, and pays himself from their stores.

You may stand near and watch them, if you will be quiet, and have not made yourself offensive to the Bees with some strong perfume. Their sense of smell is very acute, and many perfumes make them very cross. If you find that one begins to circle round your head with a sharp, rasping buzz, quite unlike the genial hum of those which are coming and going, and particularly if you find that two or three join in the song, and fly in the same curve, you had better go without ceremony. In an instant more you may expect them to dash in your face and sting you, and that a score of angry bees will follow their example. But you may usually approach without fear, and will find a busy community — "busy as bees."

A hive of Bees contains a queen, a few hun-

dred drones, and may have 15,000 or 20,000 workers. The workers are those we have seen gathering honey and pollen. They are about half an inch long, nearly black, and are armed with a straight sting. The drones are about five-eighths of an inch long, and are thicker and clumsier than the workers. They have no sting. The queen is more than three-fourths of an inch long, slender and graceful; she has a curved sting.

When a swarm of Bees are newly settled in a hive, their first business is to commence building. A part clean out the hive, while most go to the fields for honey and pollen. This latter they work into a substance called propolis, with which they glue the wax to the roof of the hive, and stop up all crevices which might admit cold, or insects. The wax is produced by the Bees themselves. Those which return from the fields hang themselves from the top of the hive in bunches, festoons, ropes, and other fantastic forms, and remain quiet for about twenty-four hours. During this time the

wax exudes between the rings of the bodies of the Bees, eight little scales coming out on each side. One leaves the festoon, goes to the top of the hive, and drives away the others from the spot where it would begin. It then takes from itself one of the scales of wax, chews it to make it pliable, and sticks it against the roof of the hive. When it has thus used all its wax, another takes the place, and lays more wax. While one works in one direction, another works in the opposite direction. Soon a thin partition begins to hang down, which will separate the ends of the two rows of cells that meet in the middle of the comb. When the two Bees working opposite to each other leave room between them, a third begins to cut out a hollow in one side of the partition, and presently two others begin to hollow on the opposite side. As fast as the wax layers extend the partition and make room, the sculpturers dig out the hollows on the sides. If the reader will press a slip of paper between the tips of two fingers of one hand and three fingers of

the other, the paper will take the shape which the wax partition has when the sculpturers have followed the wax layers. The hollows made by the ends of the fingers will represent the bottoms of the cells on either side of the partition. Now lay a number of marbles of the same size upon a table. They will lie most closely if one be put down first, and six more placed around it; when these are placed, the others will readily find their places. If the marbles were pressed into the surface of a sheet of wax, they would show the arrangement of several cells against one side of the central partition; the spaces between the marbles would show where the partitions between cells are made. But these spaces are triangular, and if filled up with wax, would waste wax and space, both which are very precious to the builders. So they cut out all that can be spared from the little three cornered places, and make the three partitions meet between three cells which join each other. Thus the six sided, or hexagonal shape of the cells is arranged.

Now there is room for more Bees to work. Some lengthen and widen the middle partition; some hollow out the cell bottoms; some lay wax for the sides of the cells, building directly out from the central wall; some smooth the interior of the cells. The same Bees do not lay the wax and smooth it too. When the work on one comb is fairly begun, the proper distance is measured, and another is laid out on either side of the first; then two more still farther away, and so on until the ceiling is covered. In a little time all the workers find plenty to do, and they work with such diligence that a moderate swarm will build four thousand cells in a day.

When the cells are made, and even before they are finished, the queen comes to lay the eggs. She first puts her head in the cell, as if to see that it is properly made, then she turns about and places an egg at the farther end. She supplies thirty or forty cells on one side of the comb, and then passes to the opposite side, where she lays as many more. In this way the

grubs in the same body of comb are hatched at the same time, and the bees come out together. While the queen is laying, the workers treat her with the greatest attention. They caress her; they feed her from their own mouths; if danger threatens, they cover her with their bodies, piling up two or three inches thick. If they are pushed aside, and the queen is taken out, they seem greatly alarmed for her safety, but do not sting. Their whole anxiety is for the welfare of their beloved mistress.

The egg hangs upon the upper angle of the cell for three days. Then it bursts, and a lively little worm falls from it. At once the workers begin to look after the baby-bee. They feed it with liquid food, prepared in their own stomachs from farina, or pollen, with honey, and perhaps water. At first the liquid is quite insipid, but afterwards contains more honey. The grub eats voraciously, and the Bees bring all it can eat. They watch the brood with tender care. If a comb containing it be placed in an empty hive, they will continue to take care of it with-

out regard to other duties. By thus removing a body of comb containing one or two queen cells, a portion of a swarm may be transferred to a new hive, without the usual process of swarming.

About five days after the egg is hatched the grub stops eating. It has nearly filled the cell, and has curled itself into a ring. Then the Bees seal it up in its cell with a cover of wax, and leave it, while it spins a silken shroud like a silkworm. This takes a day and a half; in three days more it has changed into a pupa, or chrysalis. First it straightens itself. Then the parts of the perfect Bee begin to form under the clear, white skin. The head, the eyes, the antennæ, the wings, the feet, the rings of back and abdomen, may all be seen under the silken garment which seems to be laid in shining folds about its head, and gathered up about its feet. It looks like the living mummy of a Bee. The skin changes from white and clear, to black and opaque; the parts become more distinct. On the twenty-first day from the laying of the

egg, the perfect insect throws off the black mummy wrapper, eats through the silken shroud and the wax coffin-lid, and comes forth. In half an hour she is free from the cell; she dries her wings, and on the same day goes out into the world to sip honey and gather farina with her elder sisters. As soon as the young Bee has left the cell, the workers clean it out and put it in order for another egg, or for the storage of farina or honey. A large portion of the cells are used for this purpose, the food being intended for a supply at the season when flowers are not in bloom.

The care taken of the egg and grub of the worker, though very great, can not compare with that given to the young which are to become queens. The workers act as if the fate of their nation depended upon the young creature. They feed it with a richer, more pungent, and more acid jelly, and supply more of this royal food than can be eaten. After the cell is closed up, the grub spins a cocoon, but does not complete it. This omission is often

fatal to itself, but necessary to the quiet of the hive, for the queen first hatched often stings to death her rivals which have not yet appeared. If the cocoon were complete, she might not be able to pierce it, or her sting might be entangled in the silk, which would destroy her own life. The queen ceases to be a chrysalis on the sixteenth day, but she is not allowed to leave the cell until a suitable time comes. If she were to come forth while the weather was such that a swarm could not fly, there would be two queens in the same hive, and that could not be permitted. A contest would ensue, and the older and stronger would kill the younger. So the workers keep the young queen prisoner, but give her plenty to eat.

Mean while the old queen becomes agitated and impatient. She has stopped laying eggs, and runs distractedly here and there over the comb. The workers share in her excitement, and gather about her. They fly wildly about the hive, but do not go away for food. Suddenly the confused noise within ceases. In a

second some workers come forth, and then the whole swarm, led by the mother queen, streams out and fills the air with a dark cloud. They hover for an instant about their old home, and then settle in a compact mass, like a ball, or bunch of grapes, upon a bush, or branch of a tree. If undisturbed they will soon fly again, and on swift wings vanish to some distant place, and probably be lost. While the swarm is quiet, they may be gathered in a bag or shaken into a hive. If the box be sweet and clean, and particularly if a little honey or wax has been rubbed in it, the Bees will almost always adopt it as their new home.

When swarming they are said to be perfectly harmless. Jardine says: "They are so intent on the acquisition of a new abode, and so anxious about the safety of their mother and queen, that what on ordinary occasions would draw forth many a vengeful weapon, now passes utterly unheeded by them; and the cultivator may lift them in handfuls, like so much grain, without in the least suffering for his boldness."

The young queens are left in the hive. After the departure of the old queen, the young one is allowed to come out of her cell. She at once goes to the other royal cells, and tries to kill the queens enclosed in them. Sometimes she succeeds, but the workers often crowd round her and hold her back. Excited by this treatment she sometimes leaves the hive, taking a quantity of workers with her, and so forms a second swarm This may be repeated from a large hive until three or four swarms have left. It would seem that the hive must become quite deserted from such drafts upon it, but this is not the case. The many Bees which are in the field when the swarm leaves return to their old home, and there is a multitude of young Bees in the comb, which shortly come forth and supply the place of those which left.

It sometimes happens that a queen dies, and that too at a time when there are no queen grubs in the cells. Perhaps the queen has been taken away in order to see what the Bees would do. For about twelve hours every thing

goes on as usual; the workers do not seem to know their loss. Then the community is in great distress. All labor is suspended. They rush in crowds to the door as if to leave the hive. They gather in groups as if consulting together. Then they seek the comb where worker grubs are hatched, and open three cells into one, making a royal cell. The one grub which is left in the cell is fed with royal jelly, and treated in every way like a queen grub. The same thing is done in three or four places, to make the result secure. The change of food, and the increased size of the cell, work a change in the larva, or produce a more complete development, and in due time it comes forth a perfect queen. It is known to be a fact that the Bees can produce a new queen for themselves if they have a comb containing grubs not more than three days old.

When a second queen is placed in a hive which has already a recognized queen, the Bees gather round the new comer, and though they do no violence, in a few hours she is either

starved or suffocated. If the two queens meet, a battle follows, and one is slain. Sometimes both perish. If the Bees have lost their queen, and have discovered their loss, a new queen will be at once recognized; before the proper time has passed, they treat the new queen as if the old one were yet with them.

There is another Bee in the hive, of which little has been said. This is the drone, or male Bee. He is known by his larger size, his heavy flight, and his loud humming or droning sound. He takes no part in the work of the hive, nor does he go to the field to gather honey. His life is short. About the first of August, when the supply of honey begins to fail, the Bees seem to discover that the drones are of no use in their community, and that they can not afford to support them in idleness. The drones appear to know their danger, and cluster together in a corner. By and by the storm bursts. They are driven to the bottom of the hive, and out of doors. They have their wings bitten off. They drag two or three of their

enemies with them, but their strength will not save them. They are unarmed, and the workers wear sharp, poisoned stings. Those which escape the massacre fall a prey to birds or toads, or perish with cold and hunger. So bitter is the fury of the workers, that they tear open the cells which would produce drones, kill the young, and drag the lifeless bodies out of the hive.

In all the work of the Bees, they take much pains to keep the hive uniformly warm. In cold weather the heat comes from the clusters of their bodies, and is considerably more than that of a well warmed house. In summer the hive is cooled by ventilation. A certain number of workers may always be found in hot weather, vibrating their wings on the alighting board before the door of the hive. Inside, a still larger number is employed in the same way. They stand on the floor of the hive in lines, which separate to allow the workers to pass, and extend to the spaces between the combs. The beating of their wings forces a

constant current of fresh air into the hive. This is one cause of the hum which constantly resounds from a hive where the bees are at work.

The honey may be taken from the hive, after the Bees have been removed by driving, or by suffocation, or it may be procured in extra boxes. Formerly, a dense smoke was made, the hive placed over it, and the Bees destroyed. Or the hive may be turned up, and an empty one placed over it; a few smart taps on the lower hive will drive the Bees into the upper one. But the best plan is to have the hives made in two stories, and to put suitable boxes into the upper story, communicating with the lower by holes through the ceiling. The Bees fill the boxes with comb and honey, and then they may be removed and others put in the place.

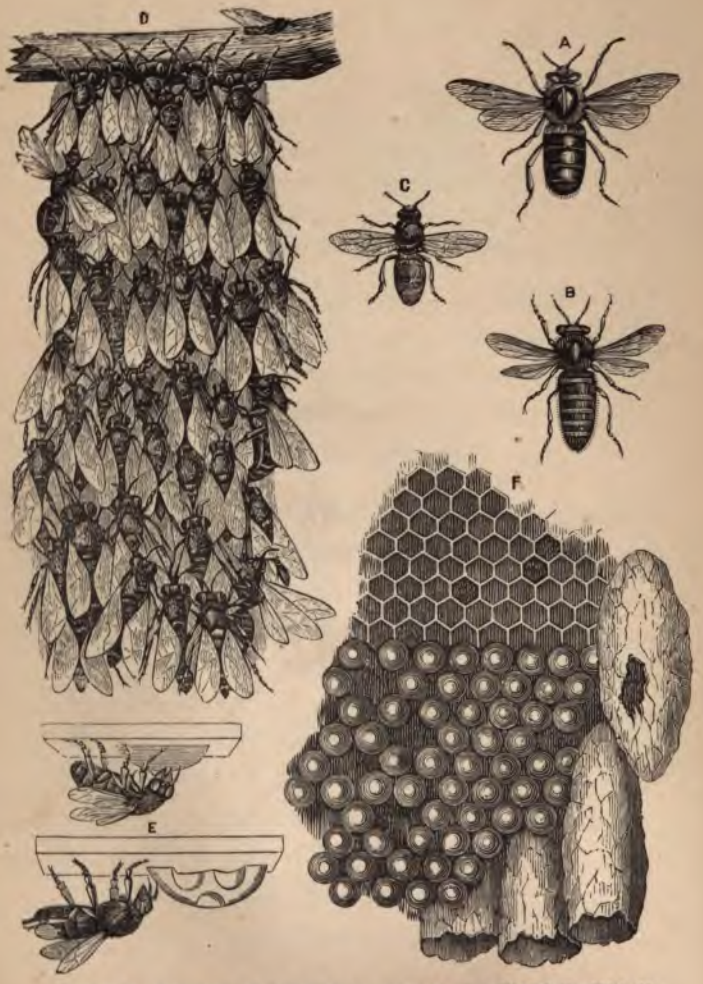
Bees are kept in most countries, but the varieties differ considerably. Fifteen or twenty kinds of hive Bees are named.

In Africa, in Australia, and in America, they are often found wild. Bee hunters sometimes derive considerable profit from the honey which they find in the hollow trunks of decayed trees. The hunter catches a Bee which is about ready to go home, marks it with a little red paint, or sticks a bit of white down to it, and then watches its flight. He goes a little distance, and takes another, which he treats in the same way. By observing several, he traces their lines to the tree, cuts it down, and obtains the honey. The wild Bees of America were not originally natives. They were brought from Europe by the English, and a swarm was carried over the Alleghany mountains in 1670 by a hurricane. The Indians call them "English Flies," and they say that the Indian and the buffalo flee before the Bees. Longfellow's Indian says of the Bees and the white clover:

"Wheresoe'er they move, before them
Swarms the stinging fly, the Ahmo,
Swarms the Bee, the honey-maker;
Wheresoe'er they tread, beneath them
Springs a flower unknown among us,
Springs the White Man's Foot in blossom."

"Wise in their government, diligent and active in their employments, devoted to their young and to their queen, the Bees read a lecture to mankind that exemplifies their oriental name, Deburah, *she that speaketh.*"

The great family of Bees may be divided into two classes: those which live in communities, and are called Social Bees, and those which living and working alone, are called Solitary Bees. The varieties of both classes are very numerous. More than two hundred and fifty species are known in Great Britain alone. The most noted of the social Bees are the common Hive or Honey Bees, which have already been described. Another kind, familiar to all my readers, is the Humble Bee. In New England these Bees are known to boys as Bumble



HIVE BEES MAKING AND LAYING WAX.

A. Queen Bee; B. Male; C. Worker; D. Bees clustering to make Wax; E. Bees *Laying* and Sculpturing Wax; F. Comb with and Queen Cells.

Bees, or Bum-bees. In different parts of Old England they are called Foggies, Dumbledores, or Hummel-bees. Let us observe the annual circuit of a family of these Bees.

In autumn the workers, the males, and all the old females, die. The young females find some sheltered place, in moss, dead leaves, or decayed wood of an old tree, where they may pass the winter. As the cold begins they become torpid, and so they remain until the bright sun and balmy air of spring wake them from their long sleep, and call them again among the flowers. At once they separate, and each, widow though she be, makes a home and founds a colony of her own. She finds a spot which suits her, and begins to dig a path in the ground. She picks out the grains of dirt with her strong jaws, passes them from one pair of legs to the next, under herself, and finally kicks them as far behind her as she can. When her passage is deep enough, a few inches or even some feet long, she ends it in a rounded cavern, which she lines with soft leaves. Some-

eral eggs are placed in one cell. As the grubs grow, the cell becomes too small, and the pressure tears it open. The Bees patch up the rent. Presently it tears again, and again it is patched. Thus in a little time it becomes four or five times as large as it was at first. The patch work is not fitted neatly, like the wax work of the honey Bees, and produces the rough, clumsy cells found in these nests. The males are more useful than the drones in the Bee hive; for though they do not gather food, they provide their share of wax. The other Bees do not kill them in autumn, but all perish together when the frosts come.

These underground cities frequently contain quite a dense population. In one nest were counted 157 males, 56 females, and 180 workers, making a total census of 343. These numbers seem small compared with the 20,000 to 40,000 honey Bees in a hive, but if we remember that the Humble Bees are much the largest, that the comb is large and very irregular, we find that so many require a large space; and

we must not forget that they usually dig the place for themselves in the earth.

Their honey is very sweet, but is apt to give headache. The wax is not clear like ordinary beeswax, and will not melt as well. Each species makes a cell peculiar to itself, either in position or shape.

Huber, while studying the habits of these Bees, placed several under a glass, with a piece of brood-comb. He took away all their wax and honey, and gave them farina only. The comb did not rest fairly on the table, and when the bees climbed upon it, to make it warm enough to hatch the eggs, it rocked to and fro. This motion annoyed them very much, but they had no wax, and could not make props to keep the comb in place. A few of the Bees then rested the hooks of their hind feet upon the comb, and braced the middle and fore feet upon the table. In this way they propped the mass on every side, and kept it steady. They remained in this position until relieved by others, taking turns together for two or three

days. Then Huber gave them some wax, which they at once wrought into pillars, beneath the comb. But in a few days the wax became dry and gave way, and the Bees had to support the comb as before.

One variety of Humble Bee does not dig a chamber in the ground, but fills up a crevice in a heap of stones, and for this has been called the Lapidary Bee, *Bombus lapidarius.*

Another is the Carder Bee, *B. muscorum.* This Bee makes a nest in some hollow upon the surface of the ground. It consists of a roof of moss, lined and bound together with moss. It has an entrance at the bottom, which is also covered with an arch, and the whole affair is shaped not unlike the huts which the Esquimaux build of snow. The manner in which the Carder Bees prepare the moss for their nest is quite curious. When several have found a supply which suits them, they form a line from the nest to the moss. The foremost Bee takes a bunch of moss and combs it with her jaws and fore feet until the fibres all lie

straight in a bundle beneath her. She then pushes it behind her, and at once proceeds to make another bundle. A second Bee takes the first bundle, combs it again, and kicks it back to a third, and so it is passed on from one to another, along the whole line to the last Bee, which puts it in its place on the roof of the house. This domed roof is made from four to six inches high.

Certain kinds of Bees have been called False Humble Bees, or Cuckoo Bees, *Apathus*. They are like the true Humble Bees in size and shape, but they lack the brush-lined cavities in the thighs for carrying pollen. These Bees do not build any house, do not make cells, or store honey, or care for their young. They are rovers, who take care of number one, and lay their eggs in the nests of other Bees. The larvæ which hatch from these eggs are stronger than the rightful occupants of the cells, and eat up all the food. So the hard working Humble Bee has built her cell for an intruder, and continues to care for it as if it were the

true heir, which it has starved out. Such things do not happen among mankind alone.

Among the solitary Bees several trades are represented. Their labors all tend to the same result — shelter and food for their young, while some work in wood like carpenters; others, like masons, build houses of mortar; others excavate the ground as miners; others find cavities, which they line with leaves, like upholsterers.

The Carpenter Bee begins her work in early spring. She chooses a bit of wood which suits her, usually the dead branch of a tree, or a weather beaten board, and in this she bores a hole about an inch and a half long and large enough to turn round in, which usually opens upon the under side of the branch or board, so that the rain may not come in. After boring directly in as far as she chooses, she turns and works several inches along the grain of the wood. All her chips she takes out and stores carefully in some place

where they will not be blown away by the wind.

When she has bored as deep as she chooses, she begins to fill up the hole again. She puts a little heap of pollen in the bottom, and lays an egg. Then she goes to her store of chips and gets material for a floor above the egg. She fastens the chips in a ring about the wall, with glue from her mouth. Within this ring she makes a second, then a third, until the partition is complete. On this floor she places another pile of pollen, and an egg; and thus she continues until the hole is full. When the egg hatches, the grub finds a supply of food; in a few days it has grown to its full size, and changes to a chrysalis, placing its head downwards. In this way the perfect Bee, as it gnaws its way out of the wood, is prevented from interfering with its younger brothers and sisters which are not yet quite ready to meet the responsibilities of society. English writers describe the Carpenter Bees as living in South America and Africa; they

may be found in various parts of the United States.

A variety of wood-boring Bee chooses the stem of the willow tree for its home. When its tunnel is finished, it flies away to a rose bush, alights upon a leaf, and cuts out a round piece, about as large as a half dime. Many persons seeing the round spaces left, charge the mischief to the caterpillars. The Bee stands upon the piece which she cuts off, and as it falls she flies back to her nest with it in her jaws. She bends it into a cup shape, and stuffs it down to the very bottom of the hole. When the cell is suitably lined, she puts in some pollen and an egg, and covers it with another bit of leaf, which is the floor of a second cell. When the leaves are dry and stiff, they are so compact that the whole may be taken out together, and then separated into sections, like a row of thimbles thrust into each other. One variety of the Upholsterer Bee uses the scarlet leaves of the poppy for the silken lining of its cradle.

When a boy, the writer was somewhat frightened by a bee which came into his bedroom. The alarm was soon changed to curiosity, when the Bee was seen to examine an old inkstand, which had several holes in it for holding pens. The Bee would enter one of these holes, remain an instant, fly away out of the window, and presently come back to the same place again. So she buzzed about all that day and the next, and by the end of the second day she had filled up all the holes in the inkstand, and plastered them over neatly with mortar. She explored the central place, where the ink should be placed, but although it was dry, it did not suit her, and she departed. The holes were found to be divided into cells by partitions of mortar, and in each cell was a grub which would have become a Bee.

Other Mason Bees build a mass of cells, placed side by side, in a lump, which they stick against the side of a wall, or in a corner. They love to work in the dark attic of a house,

where they are undisturbed, finding entrance through some crevice or knot-hole.

They frequently fill the hollow stems of old raspberry vines, and the smaller kinds fill straws or nail holes. In fact, they occupy all sorts of odd and queer places, even filling up the scrolls of a snail shell.

There is no better sport for a boy than the watching of one of the working insects in a quiet afternoon among the summer holidays. Unlike the birds, they do not mind the presence of a visitor, and go right on with their work. An ant hill, a Bee hive, a solitary Bee, a spider spinning his web, or a hornet building his paper mansion on the other side of the window pane, will pay for many an hour's silent observation. And the quiet boy, with watchful eyes, will find many chances of seeing them, which he least expected.

THE GREAT MYGALE. *Mygale cancerides.*

About Spiders.

Articulata.— Insecta.

Order — *Aranidæ*. Spider-family.

CURIOUS and beautiful forms are found in every department of the insect world. In all its infinite variety there are none which do not pay for careful, watchful study. We have described two great tribes of workers. Each is busy, one not more than the other. "Go to the ant, thou sluggard," says the wise man, "consider her ways and be wise."

So doth the little busy bee
Improve each shining hour;
And gathers honey all the day,
From every opening flower.

We come now to the family of spiders. They are workers, too, in their way, but their labors are devised only to carry on their great business of preying upon other insects. They are carnivorous insects; made to live upon flesh, just as the animals of the cat tribe live upon other animals, and as the hawks prey upon other birds. They serve a very important purpose in the insect world, for they help to keep other tribes, which would increase too rapidly, in their proper proportion.

Many people have a natural dislike to a Spider. They are known to bite, that is, to sting — flies, at least — and there is a kind of fear that they may sting men or children. They seem to be very crafty, and then they run so fast, and in such unexpected ways, that young ladies think it quite proper to scream, or run, if a Spider happens to come her way. Then the

housekeepers hate them because they spin webs in the corners; the webs gather dust, and the room is untidy. The offending webs are swept down, but the Spiders are diligent, and in a few hours replace the webs. So the housewives search diligently, and without mercy put the persevering insects to death. It may be that perseverance, as an abstract quality, is not as valuable as some people think. Perseverance in a good cause, to attain a desirable object, is very commendable, but perseverance in an evil way only makes the evil worse. We are apt to think that ways which are not in harmony with our ways are wrong, and so the housewife very much dislikes the perseverance of the Spider.

Goldsmith writes of a Spider which he watched. It was three days making its web; then another Spider came, and in the battle which the two had for the web they nearly ruined it. Three days more were spent in repairing damages. When the web was complete again, a wasp was caught in it, and as the

Spider did not dare engage so powerful an enemy, it cut the bands and let the wasp go. But the web was so torn that the insect thought it easier to make a new one, than to repair the old. This new web Goldsmith destroyed, and the Spider made another. Again he destroyed the work, but the poor creature could spin no more. It had spun four entire webs, besides making repairs enough to complete another, and had worked nearly fifteen days. Its only resource for a living was to drive another Spider from its web, and take possession.

In shape and structure the Spiders are all similar, but unlike most other insects. A wasp, a bee, or an ant, has three distinct parts — a head, a body or thorax, and a belly or abdomen; and these three parts are connected by slender cords or tubes. The Spider's head and body seem to have been soldered into one piece, as if a man's head were set firmly upon his shoulders. Naturalists call this the *cephalothorax*, or head-chest. Its body, as well as the eight legs which are joined to it, is covered with

plate armor of strong scales. The fore part has two branches, which might be called arms, each furnished at the end with a curved sting, shaped like the claw of a cat. Each claw has a tiny opening near the point, through which poison passes into the wound which it gives. When a fly is caught in its toils, the Spider runs to it, and strikes with these arms, inflicting wounds with its poisoned dagger-claws. In different parts of the head the Spider has several eyes, generally eight, but sometimes only six, and these eyes are arranged differently in different species. The number seems to make up for their want of motion.

The hind part of the Spider is covered with fine supple skin, and clothed with hair. Near the end are four, five, or six, little swollen spots or spinners. Each of these has a multitude of little tubes, so many that the microscope has shown a thousand in a space no bigger than a pin's point. Out of these tubes comes the material of the Spider's web. At a little distance, the threads from all these tubes of one spin-

ner join, and then the strands from all the spinners are joined together. Thus the thin spider-line which one can barely see, as it glitters with moisture in the sunshine, and in many positions can not see at all, is made of four or six strands, each strand composed of more than a thousand threadlets. This wonderful cable is strong enough to support the Spider herself. She often stops spinning in mid-air, turns back and climbs up the same cord to the place whence she let herself fall.

The spinning of the Garden Spider is probably not more curious than that of any other, but it is rather more easily observed. Sometimes one begins her web on the outside of a window, and is easily watched from within. She begins by pressing the spinners against the wood of the window frame; a little of the gum exudes, and fastens one end of the line. She runs along, giving out line as she goes, until she finds a good place to fasten at, where she presses herself against the wall, making the other end secure. She first stretches a few lines about the

space which the web is to fill, forming a triangle, or a four-sided figure. She then draws a line across the middle of this space. All these lines she makes very strong, doubling some of them several times. If any of them seems to become slack, she fastens a line near one end, and pulls it aside, until the main line is taut. Now she goes to the middle of the cross line, fastens a line there, and then runs back to the margin and fastens it an inch or so from the end of the cross line. She goes to the middle, and stretches another line in another direction, and then another, as if she were putting in the spokes of a wheel. While doing this she does not put in the rays or spokes on one side first, but draws her lines in opposite directions, keeping the strains all the time even. When she is about the first part of the work, running the marginal lines, and placing the first few spokes, she works slowly, stopping now and then to plan; but as the web progresses, she seems to have solved her problem to her satisfaction, and hurries on the work.

Presently the rays are all set. Then she goes to the centre, and lays down a spiral line, fastening it to every spoke, and drawing it round and round, at even distances, in ever widening circles, until she comes to the outside. The main lines and rays are made stout and firm. The spiral lines are very elastic, and may be drawn far out of place without breaking. The garden Spider finishes her web in a few hours. She works as well by night as by day; in the dark as in the light.

When her web is done, she hangs herself in the middle of it, with her head downwards, waiting until some insect becomes entangled in her snare. When she feels the web move, she rushes to the spot. If the game be small, she thrusts in her dagger, and kills it at once. If it be large, and there is danger that its struggles will tear the web, she at once winds it round and round with cords, which she spins as she goes. She ties it, wing and foot, until its struggles can do no harm; then she gives the fatal blow, and eats the victim at her lei-

sure. If the insect is so large that she can not manage it, she cuts away the threads as quick as possible, and lets it go, before it has torn her web in pieces.

A writer for the "Atlantic Monthly," a surgeon in the United States Army, gives an interesting account of the spinning of a kind of Spider, *Nephila plumipes*, which he found on one of the sea islands near Charleston. These Spiders were quite large. The females were from an inch to an inch and a quarter long; the males were only about one fourth of an inch long, and about one hundred and twenty would have weighed as much as one of their buxom wives. Accident showed him that he could reel the silk from the living Spider. He therefore gathered as many as he could find, and brought them north to experiment with. When ready to spin, he fastened each in a little frame of cardboard, which would hold the insect without hurting it. Then he reeled the silk upon a suitable reel. From one he wound about one thousand yards, and from

another over *two miles* of silk. A single thread sustained a weight of fifty-four grains.

The silk from the same Spider was of different colors and qualities. At the same instant he wound from one insect one thread golden yellow, and another bright silver white. If the two ran together, they made one light yellow thread. The white silk, when dry, was firm and unyielding, suitable for the rays of a Spider's web. The yellow was very elastic, like that used for the spiral rings which bind the rays together. There was also a pale blue silk which seemed to be used to tie up an insect after it was caught in the web. Enough silk was reeled to be woven in a loom, upon a warp of black silk, so as to make a bit of ribbon two inches wide, showing that it was real silk.

The House Spider usually puts her web in some corner. She runs out as far as she intends to spread the web, fastens a thread to the wood, then goes back to the corner and out on the other side, until she comes opposite the place where she first made the thread fast, and

there fixes the other end. Then she places a second and a third thread beside the first, for these make the foundation of her whole work. From these she draws other lines to the angle, and then she works back and forth over the whole, until the piece of gauze is done. She then stretches a great number of threads from side to side above her web, crossing them every way. These lines are arranged not unlike the tackling of a ship, and often reach two or three feet high. The flies passing through the space become entangled, fall upon the web below, and are caught. Besides all this, she makes a round funnel, for a hiding place, below the web, in the corner, or behind some piece of furniture. Here she waits and watches, out of sight. If the least touch disturbs the web, she feels it, for the rays from every part pass down into this funnel, and she rushes forth to learn the cause.

A Spider of Jamaica is called the Trap-door Spider. This insect digs a burrow in the ground, and lines it first with coarse, rough

web, which seems more like the paper of the wasp's nest than the silk of the Spider. The inner lining is smooth and soft, and may be drawn out of the other, without injuring either. The tube is placed where the surface of the ground is a little sloping, and the mouth is covered with a door, made like the lining of the tube. This door is fastened by a hinge at the upper edge, in such a position that it falls into place by its own weight. The outside is covered with earth, which perfectly conceals the nest. A stranger may well be startled at seeing a hole open in the ground at his feet, and a large Spider peep out to observe what is going on. One of these Spiders dug its tube in cultivated ground. After it was made, the earth was heaped over it about three inches; the Spider finished out its tube, and made a second door at the new surface.

This Spider is about an inch and a half long. It leaves its burrow at night and hunts for its prey. If any one attempts to raise the trap, it hooks its hind legs into the door, and its fore

legs into the side of the tube, and holds on with all its might. It will suffer its nest to be dug out of the ground and carried away without leaving it; in this way they have been caught and put where they could be watched. Other species which make their home thus are found in Australia and elsewhere.

In Surinam, and on the Amazon river, Spiders are found of the genus *Mygale*, which destroy birds. When this was first reported, it was not believed, but the Spiders have been caught in the very act. When we consider the size which they attain, the wonder ceases. One is described as two inches in length of body, and more than seven inches in expanse of legs. It was covered with coarse red and gray hairs. Some of these huge Spiders make a dense web; one digs a burrow two feet deep, and lines it with silk. When the children catch one of these fellows, they tie a string about its waist, and lead it along like a dog. The Mygale sheds its hairs easily and they pierce the skin

of one who handles it, causing painful irritation.

The name Tarantula is given to several large Spiders that live in the ground and hunt for prey. The Italians have a belief that one kind will cause a disease which can be cured only by dancing a long while to peculiar music. The sting really makes but a slight wound.

One member of this family lives in the water. Still it lives by breathing air, and therefore it takes a supply along with it down under the water into its nest. Like all the other Spiders, this makes its nest of silk; it is generally about as large as an acorn, egg-shaped, and open below. This cell is filled with air; and if the Spider be kept in a glass vessel, it may be seen in its cell, resting in Spider fashion, with its head downward. Where the air came from was, for a long time, the question. Some thought it was the oxygen which was formed by the water plants.

A few years since, Mr. Bell saw some of these Spiders spin their webs, and fill them

with air. When one had made her web, she went to the surface, grasped a bubble of air, descended quickly to her nest, and thrust the air in. Then she came up for more, and after twelve or fourteen journeys she had laid in her supply. When enough had been collected, the Spider crept in and settled herself to rest in her transparent cell.

"The manner in which the animal possesses itself of the bubble is very curious. It ascends to the surface slowly, assisted by a thread attached to a leaf below and to one at the surface. As soon as it comes near the surface, it turns the extremity of the abdomen upwards, and exposes a portion of the body to the air for an instant, then with a jerk it snatches, as it were, a bubble of air, which is attached not only to the hairs which cover the abdomen, but is held on by the two hinder legs, which are crossed at an acute angle near the extremity, this crossing of the legs taking place the instant the bubble is seized. The little creature then descends more rapidly and regains its

cell, always by the same route, turns the abdomen within it, and leaves the bubble."

The water Spiders feed on the insects which swarm in the water, eating their prey in their homes.

Another aquatic Spider builds a raft. It gathers together a mass of dry leaves and similar things which will float, and fastens it with silk threads. On this raft it sits, floating wherever the winds and waters carry it. When the water insects come to the top, it seizes them before they can escape. Others fly over the surface for their prey, and fall into the jaws of this Spider-wolf. It is quite large, and very beautifully colored and marked.

At certain seasons of the year, large quantities of gossamer threads are seen floating in the air. They fall upon the grass and streak it with fine lines. They gather on the trees. The steamboat, plowing up the long lanes of water through forest and prairie, gathers streamers and pennons of gossamer on every pole, and the rough helmsman frets as the films

catch upon his eyebrows, and dim his sight. All this is made by Spiders. They climb to the tops of trees, and pushing the gossamer out at their spinners, let it float upon the air until its buoyancy is enough to carry them away. Balloonists have found these Spiders floating in the air above their cars.

Says Gilbert White: "Every day, in fine autumnal weather, do I see these Spiders shooting out their web and mounting aloft. They will go off from your finger if you will take them into your hand; last summer one alighted on my book, as I was reading in the parlor, and running to the top of the page and shooting out a web, took a departure from thence. But what I most wondered at was, that it went off with considerable swiftness, in a place where no air was stirring; and I am sure I did not assist it with my breath; so that these little crawlers seem to have, while mounting, some locomotive power, without the use of wings, and move faster in the air than the air itself."

There are spiders which lie concealed in a

rolled up leaf, and seize any insect which comes in the way. Others lurk in the cup of a flower, and eat the fly that comes for honey. Some hunting Spiders leap upon their prey like tigers, and have a way of jumping sideways. They steal upon their game as a cat steals upon a bird. If the fly moves, the Spider moves too — backwards, forwards, or sideways — until the two seem to be moved by one unseen spirit. If the fly takes wing and alights behind the Spider, it turns about with the swiftness of thought, too quick for the eye to follow. When its movements have brought it within reach of its victim, its leap is sudden and deadly as lightning.

The Spider is very watchful over its young. Most species do not lay eggs until two years old. Then the female prepares a cocoon of silk, very thick and strong, in which she places from fifty to a hundred salmon-colored eggs. This sack is often made of two dish-shaped pieces, fastened together at the edges. Sometimes it is hidden in the crevice of a wall, or

under the edge of a loose board. In this case it is securely fastened by a net-work thrown over and about it. It is often carried about by the mother, attached beneath the abdomen, or held in the jaws as a cat carries her kitten.

If any attempt is made to carry away this treasure, which the mother always watches over, she resists it to the utmost. When taken from her, she becomes listless, as if stupefied; if restored, she seizes it eagerly, and runs away with it to a safer place. When the young are hatched they remain in the cocoon until, at the proper time, the mother bites it open and sets them free. Even then they do not leave her, but remain, like a brood of chickens, under her care. She often takes them upon her back; she provides food for them, and leads them about until they have age and strength to shift for themselves.

The gentleman who obtained the silk spinners from Charleston harbor, procured a large number of these egg sacks, and in a short time had a brood of about *two hundred thousand.* One

bright June day he left them on a tray in the sun, and on his return found his brood — *baked.*

A supply of Spiders, which he kept in little paper boxes, furnished a fresh harvest of eggs, from which about seven thousand were hatched. They appeared in about a month after the eggs were laid. For a long time they seemed to eat nothing; then they shed their skins, and began to grow. As they grew, their numbers diminished, and it began to be evident that they were eating each other. Shut up in the sacks they had nothing else to eat, and the weaker ones were a prey to the stronger. They were then placed in inverted glass jars, with wet sponges in the mouths, and were fed with flies, bugs, and afterwards with such flesh as bits of chicken's liver. Some of the first family brought north seemed to go into a decline and die, for no cause which their keeper could understand. He tried various expedients with them, but nothing did any good. At last he thought of giving them water, although he had never known that Spiders drank water. A

drop was given on the tip of a camel's hair pencil, and was eagerly seized. All the Spiders drank, some taking several drops. Besides water to drink they required some moisture in the air. They became quite tame; would eat and drink from a bit of stick, or a pin, and when stroked gently, would raise up the back like a cat, or put up a foot to push away the finger.

As was said before, the Spider is a type of industry and perseverance, no less than the ant or the bee. The Scottish farmers love to tell that King Robert Bruce once learned a lesson of endurance from a Spider. While wandering on the wild hills of Arran, he passed a night within a poor, deserted cottage. He threw himself down upon a heap of straw, and lay, with his hands under his head, unable to sleep, but gazing up at the rafters of the hut, festooned with cobwebs. From long and dreamy thoughts about his hopeless condition, and the many evils which he had met, he was roused to notice the efforts of a poor Spider, which had

begun its work with the first gray light of morning. The insect was trying to swing by its thread from one rafter to another, but it constantly failed, each time swinging back to the point from which it sprang. Twelve times the little creature made the attempt, and twelve times it failed. Without delay it tried again, and the rafter was gained. "I accept the lesson," said Bruce, springing to his feet; "I shall again venture my life to win the battle for my country." And the victory was won.

WINGED ANT-LION. *Myrmeleo libelluloides.*

About Dragon-flies.

ARTICULATA.—INSECTA.

ORDER — *Neuroptera.* Net-winged.

FAMILY — *Libellulidæ.*

LONG, slender insect, with large head, swollen on either side by a huge eye, flying with four broad, gauzy wings, is a frequent mid-summer visitor. He and his mates range up and down in the air, pausing here a moment, then darting away in the most unexpected manner. He comes into the house with a great buzz, and makes vain attempts to fly back to free air through the window pane. He seems to have no particular

business, except flying about, buzzing, and bumping his head. The children call him a Darning-needle, because his body is straight and slender; and as its long and flexible tail twists about more than seems pleasant, they are afraid of it; they believe it can sting, and some call it a Horse-stinger. But the creature has no sting, and can do no harm to man or beast. In the insect world he well deserves his name, Dragon-fly, for he devours multitudes of other insects. When dancing in the sunshine, or in the twilight shadows, he is busy catching gnats, or sweeping up other minute specks which fly in the air. He is not content, even, with such small game, but is the eagle among insects, pouncing upon unwary butterflies, which he drags to some bush to devour at his leisure.

The water is his birth-place. The eggs, like a bunch of grapes, sink to the bottom and hatch out six-footed larvæ, with dusky brown skins. Like many other grubs, when these youngsters grow too large for their clothes, they split them open, throw them away, and

soon appear in a new and larger suit. When full grown, a pair of scales appears on the back, which is a mere suggestion of wings. The head is then armed with a long, jointed trunk, fitted at the end with a pair of strong hooks. While at rest, this trunk lies folded over the face, like a mask; if any prey passes by, the trunk leaps forth, and the hooks grapple the unwary victim.

The Dragon-fly lives as larva and pupa, two years. When ready to come out into the world, it climbs to the top of some water plant, into the sunshine. The eyes show when the change is coming. Instead of dark, dull places where eyes might be, they become clear and bright, and the real eye shines through the mask. If one can be found at this crisis, and fastened where the change can be seen, it will yield much amusement.

First a rent comes in the skin along the back, to the face; here another rent opens crosswise, over the eyes. Now that he has burst his case, he carefully picks out his legs,

and then hangs his head down, motionless, as if dead. He has only hung his moist legs out to dry. Presently he lifts himself again, grasps the case with his feet, and slowly draws out his long tail, and wet, sodden wings. But the tail has not its full length, and the wings are folded. He rests awhile; the tail expands, the wings unfold, and as they harden, glisten like sheets of mica. While in this wet condition, the Dragon-fly is careful not to touch them, even with its body; for a wrong twist now would make a deformity for ever. The change may be passed in a quarter of an hour, or may take several hours, according to the clearness of the air. When the wings are fully spread and hardened, and the bright colors of the mailed body are fully set, he leaves his twig and begins his long journey through the air. Like a newly commissioned Alabama, armed and supplied for a long cruise upon the high seas, he sets forth, a piratical rover, to capture, plunder, and destroy.

While living in the water, this creature has

a way of moving about peculiar to itself. If seen at the bottom of clear water, it seems to move merely because it wills to move, with nothing like walking or swimming — it goes. But if a few grains of sand be near, they seem to will to go backward, at the same time. Put one of the larvæ into water colored with milk or indigo, and then suddenly change him into clear water, and the motion will be explained. He will be seen to spirt a stream of colored fluid into the clear water, and it will be found that he has in his abdomen a set of force pumps. These fill slowly from the fluid in which the larva floats, and then drive out the water backwards, while the same force which ejects the water, pushes the insect forwards. Some English ship-builders propose to drive steamships by this plan, which it may be they borrowed from this very insect. They take water through the bottom of the ship, and then drive it out astern by powerful steam pumps. In this way they expect to force the vessel rapidly through the water.

We nave mentioned the large globes of eyes on either side of the Dragon-fly's head. Under a small lens these eyes seem to be covered with fine net-work. A magnifier of larger power shows that the surface is composed of regular, six-sided faces, so that it resembles a minute crystal honey comb. Farther examination shows that each eye contains more than 12,000 of these lenses, and that what we call the eye is only a bundle of eyes.

Opticians grind a multitude of flat faces on a rounded bit of glass, which they set in a tube. Any thing seen through this tube seems multiplied as many times as there are faces on the glass; the image is very pretty, but very much confused. We need not suppose, however, that the Dragon-fly is puzzled by his compound eye, or that he sees more than one image. Although we have two eyes, we do not see double. The nerves which carry word to the brain that the eyes see something, meet just behind the eyes, and perhaps, for this reason, report but one object. If two eyes thus unite their results, so

that we do not see double, in the same way 25,000 eyes in one head may combine all their results. The fact that we see so many images in the multiplying glass will not trouble us if we remember that our own eye is behind the glass, instead of a bundle of nerves, and there is no way of gathering all the images into one.

There are many species of Dragon-flies, strong of wing, and beautifully colored with bright blue, green, scarlet, glossy black, or transparent white. The body is often of one hue, while the wings are barred or spotted with others. Often the male and female of the same species are variously marked. These bright colors always vanish when the animal dies; in a few days the most brilliant specimens will have faded to a blackish brown. The only way to preserve them is to remove the interio substance, and fill the space with paint of the proper color, and this method does not repay the time and labor spent.

One tribe belonging to this family are called

Scorpion-flies. The rings near the end of the tail are quite slender, and move easily in any direction. The last ring is stout and thick, and bears a strong pair of forceps. When the fly is at rest, the tail is curved over its back like that of a puppy, but when alarmed it flourishes the tail in a very alarming style, the forceps snapping as if something serious would happen if there were a chance.

Some other members of the order *Neuroptera*, or nerve-winged insects, are worthy of notice.

The large, prominent eyes of the Lace-wings, or Golden-eyes, glow with changeful flames of gold and ruby, as if on fire. These insects are small, but their brilliancy and their broad wings make them quite conspicuous. The larva of the lace-wing is very voracious. It is particularly fond of the plant lice, and therefore is quite useful. A single one will clear a densely crowded twig in a short time. It will, however, turn and eat the eggs in which its brothers are ready to hatch, if it can reach them. To prevent this, the instinct of the

mother makes her spin a slender thread, like a bit of bristle, about a third of an inch long; the lower end of this thread she glues fast to a twig, and on the upper end she leaves an egg about the size and shape of the letter **o**. So she places a dozen in a group, which is easily mistaken for a patch of moss. For a long time these were really supposed to be a variety of moss, nobody suspecting that they were the eggs of an insect. When the first hatches, he falls down upon the twig. He reaches up to breakfast on another egg, but he can not climb the slender waving stalk, so he creeps away, and finds his meal elsewhere.

A somewhat celebrated insect of this family is the Ant-lion. In its perfect state it much resembles the Dragon-fly, but the wings are broader and softer. It is most remarkable when a larva. Then it resembles a flattened maggot, with long legs and large jaws; but the legs are of little use for walking, as it moves mostly by means of its abdomen. It is very slow, and yet very voracious, living on insects

much quicker than itself, which it catches alive. As it can not take them in open chase, it sets an ambush by digging a pit, and lying concealed at the bottom. In this work it begins at the outside. It presses its body down into the sand, and then backs round in a circle, plowing the earth and throwing it outward. So it goes round and round, drawing one furrow after another until it comes to the middle. This plowing is repeated several times, as long as it will turn the earth outward. Then it begins to dig. It goes to the middle, and flings the sand out with its head, and smoothes the sides of the pit, down to the centre, into a regular funnel. If it finds small stones, it jerks them, one by one, over the wall. If too large for that, it takes them on its back and carries them up the slope, and tumbles them over the edge. Sometimes, after toilsomely tugging until a stone is nearly at the top, the pebble topples off and rolls to the bottom again, plowing a furrow as it goes down. The Ant-lion tries again, pushing the load up the same furrow; he

works on until the stone is removed, or until repeated failure satisfies him that he is not equal to the task. Then he leaves the unfinished pit, and digs another.

When finished, the pit is about two inches deep, and three inches in diameter. The Ant-lion lies at the bottom, only his jaws being in sight. When an ant, journeying that way, looks over the edge, the loose sand under its feet begins to slide, and lets it down into the pit. It struggles to regain the top, but that only hastens its fall, and down it goes into the jaws of the hungry monster which waits for it at the bottom. If the ant succeeds in climbing up, and is likely to get out of danger, the Ant-lion shovels sand upon its head, and flings it after the escaping insect. Overwhelmed by this storm the ant is borne to the bottom. When the juices are sucked out of him, the empty skin is tossed over the mound, and the pit is put in order for the next unfortunate.

Thus the Ant-lion lives for about two years. Then it wraps itself in a covering made of sand

glued together, and bound by a kind of silk which it spins. In about three weeks it emerges in its perfect form.

Another of the *Neuroptera* is the May-fly, or Ephemera. The early days of summer bring vast swarms of them, which vanish as suddenly as they come; often a single day is sufficient for the entire round of their perfect life. Hence the name Ephemera—"(lasting) for a day." It is, however, a mistake to suppose that a day is enough for the entire life of the insect from the egg to the grave. On the contrary, two years are passed in the water before the winged form is assumed. Like other creatures that flit a few brief days about watering places—although it does not carry a Saratoga trunk full of finery—it can not do without a change of dress. So, after dancing its set in one costume, it retires to its chamber—a twig—kicks off its garment, and appears in another, bright and new, with larger wings, broader plumes, and longer train.

In both dresses, the May-fly is very eagerly taken by fish, and adroit anglers use them, or

SECTION OF TERMITES' NEST.

imitate them, when they would bring wary old trout from their deepest hiding places. Very much alike — Newport belles, and Newport May-flies!

Termites.

The remarkable insects known as Termites, or White Ants, though commonly called ants, are not classed with that order, but among the *Neuroptera*, on account of the structure of their wings in their perfect stage. Like the ants, the Termites live in societies, which become immensely large. They build for themselves huge cities, great mounds, conical like sugar-loaves, sometimes twenty feet high, and more than a hundred feet in circuit. They make these of clay, and so solid and strong, that the wild cattle climb on them without breaking through. Within they are full of chambers and passages. There are

apartments for the king and queen; nurseries for the young; garrisons of soldiers; dwellings for workmen, and storehouses for food. These edifices are said to surpass the dwellings of ants, bees, and beavers, as much as the architecture of Europeans excels the rude huts of Indians or Bushmen. Some species build in the ground, partly beneath and partly above the surface; others build on branches of trees, and often at a great height.

One of the best known species is the *Termes bellicosus* of Africa. In Senegal, and parts of Central Africa, their numerous clusters of hills resemble the huts in the native villages. The first hill which they make, in beginning a settlement, rises above the ground perhaps a foot. While this grows larger and higher, others spring up at a little distance, and still others, until a circle of small hills surrounds the larger one in the centre. These all keep on growing; presently they join each other, and the middle cone includes or covers up the outer ones. Mean while the inside works

which were first made, are pulled down, and the materials are used for building the outer cones. They have no precise form, the only care being to make them firm and strong. Until they are six or eight feet high they are quite bare, but after that they increase more slowly, and grass often grows upon them. In the hot season, when the grass becomes dry, the whole resembles a large haystack.

The royal apartment, as the most important room of the house, is placed in the centre. It is shaped like half of an egg, cut lengthwise, and is at first about an inch long; it is afterwards enlarged to suit the increased size of the queen, until it is six or eight inches long, or even more. The openings through the walls and roof of this room are large enough to admit the workers which are in attendance, but the royal occupants can never pass out; they are life-long prisoners. A set of chambers about the royal cell contains the soldiers who protect, and the workers who serve the regal prisoners. These rooms are connected

together; they extend a foot or two all round the central apartment. They are surrounded by the nurseries and the storehouses. The latter are built of clay, and filled with gums and similar vegetable substances. The walls and partitions of the nurseries are made of woody fibre, cemented together by the saliva of the insect. When the nest is small, they are near the royal chamber. As the family grows, and the attendants of the queen become more numerous, the nurseries are moved farther away. They are enclosed in clay chambers, like the granaries, and the wooden partitions and linings would seem to prevent too sudden changes of temperature.

A large arched open space, two or three feet high, is left under the central dome, with arched passages on every side, which allow the warm air to circulate freely, and keep the nurseries at a proper degree of heat. The shell which forms the great dome is traversed by large round or oval passages, several inches wide. These ascend spirally, quite to the top,

opening into each other, and into the central dome at proper distances. Other passages of less size connect the larger ones, and others still lead far away under ground. Even if all the Termites within a hundred yards of a house were destroyed, those which live farther away would extend their galleries to the house, eat up the merchandise in it, and destroy every thing. If they can not go under ground in the way they wish, they make pipes along the surface, of the same material as their nest; they often carry these covered ways above ground over the deeper paths, and make frequent communications between them, so that they can escape by one, if they are attacked in the other.

Each village of Termites has a king and queen, an army of soldiers, and a population of laborers. There are about a hundred workers to one soldier; they are about a quarter of an inch long, very busy and very swift. The soldiers are half an inch long, and as large as fifteen of the workers. The winged or perfect

insects are nearly an inch long, and their wings spread above two inches and a half. They are equal in bulk to two soldiers. The young Termites come out of the nest just after the first shower has opened the rainy season. The immense swarms fill the air as with dense white snow flakes. Every living thing seems to be their enemy. The ants fall upon them and eat them; birds come in flocks and pick them up; reptiles and ant-eaters devour them, and the black men gather them as the greatest delicacy. Not one pair in a hundred thousand escapes alive, but that pair will, by and by, produce a hundred thousand a day.

While the winged insects are flying, and being eaten, the workers are running about on the ground searching for them. If a pair is found, they are at once chosen king and queen, and their new subjects proceed to build them a house. They are shut up in a little clay chamber, with only one small entrance, too small to allow them to pass out. Presently the female begins to enlarge in a wonderful manner; and

the house has to be enlarged to correspond. In time, it is thought about two years, she is about three-fourths of an inch wide and three inches long — specimens have been found of twice that length. Her body is now oblong, banded at intervals of half an inch with dark muscles. The transparent skin is of a fine cream color, through which the intestines, and the motion of the fluids, may be clearly seen. When she has reached this size, she produces about eighty thousand eggs a day. The attendant workers carry these away to the nurseries, where they are hatched, and the young provided with every thing needed, until they are old enough to shift for themselves.

When a person enters a piece of ground which is marked by many of the covered ways of these insects, he hears an alarm given by distinct hisses. After that he may search the paths for Termites in vain; they have escaped by the underground lines. The tunnels are made large enough for passing and repassing without trouble. They serve as shelter from

light and air, and particularly from the attacks of other ants. When driven from these defences the ants pounce upon them, and carry them to their own nests to feed their young ones. If the defence is broken, the workers at once set about repairing it, and even if three or four yards is destroyed, the place will be rebuilt before the next morning. If the gallery is often destroyed, it will be given up and another made, unless it leads to some favorite plunder. The main roads are made deep under ground, going under the very foundations of houses and stores, and come up under the floors, or through the posts on which the building rests. While some are boring the posts through and through, and taking out all their fibres, others climb the outside and enter the roof. If they find thatch, which they seem to like very well, they bring up clay and make covered ways in and through the roof as long as it will stand. Thus they carry away, bit by bit, every sill, and post, and beam, floor, ceiling, and partition. The outside seems firm

and sound, but the whole will crumble at a touch. Sometimes they seem to know that a post sustains weight, and then they fill up the cavities which they make with clay, packing it in more solidly than man could. The posts are found filled with material as hard and compact as many kinds of building stone. They will eat the very mat on which a man sleeps. They carry away all the wood of his strong box, leaving a shell as thin as paper. They devour his books, his records, his correspondence. If a piece of furniture be left too long in one place, nothing will remain but the surface. A man may be rich to-day, and poor to-morrow from their ravages.

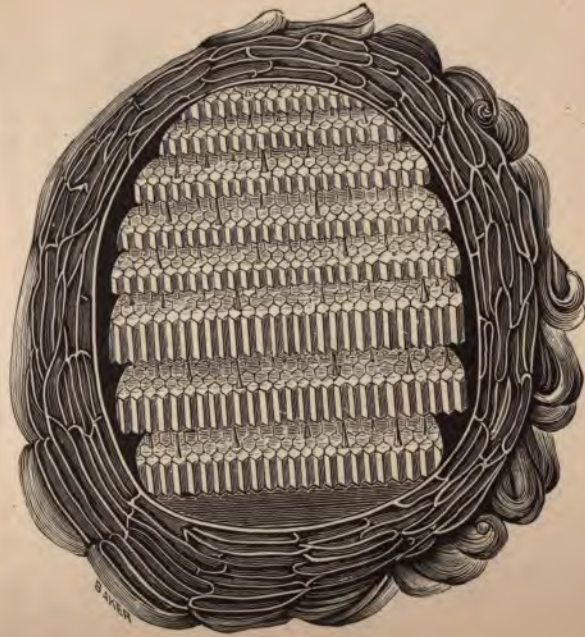
It is a difficult task to destroy them. Any thing which is washed with corrosive sublimate they respect, but this can not be applied to many things. If the house is broken into, the soldiers come to the breach to defend it. They may be destroyed, but they are not those which do the mischief. The workers are left, and the business of the village

goes on just as before. The only plan which is at all sure is to continue pulling down the nest until the chamber of the queen is found, and she is destroyed. Then the others seem to be bewildered, lose courage, and finally abandon the nest.

About the year 1780, some bales of goods, brought from St. Domingo, were stored in La Rochelle, and in other French seaports, and thus the Termites were introduced. At La Rochelle they took possession of the arsenal, and of the prefect's house, invading rooms, offices, court, and garden. A stake driven, or a plank left, in the garden, was destroyed forthwith. One fine morning the records of the office were found ruined, though not the least trace of damage was seen on the outside. The Termites had mined the wood work, pierced the card-board, and eaten up parchments and papers, but had always scrupulously respected the upper leaf, and the edges of all the leaves. By chance a clerk raised one of the leaves which hid this ruin, and discovered the injury.

OUTSIDE.

A WASP'S NEST.



INSIDE.

About Wasps.

ARTICULATA — INSECTA.

ORDER — *Hymenoptera*. Membrane-winged.

FAMILY — *Vespidæ*. Wasp-like.

ASPS attract attention, for two reasons. They have sharp, venomous stings, which they are ready to use on small provocation, and so make us afraid of them; and they build for themselves curious homes, which are well worth our study. Those that we are most familiar with, build with mud, or paper.

The paper makers usually choose some sheltered place, under a fence rail, in a bush, in a

hollow tree, or under the projecting eaves of a house. As in the case of the humble bees, the mother of the family, single handed and alone, lays the foundation of the house, and makes preparation for rearing a family. She and a few like herself are the sole survivors of the thronged cities of last year. All the others perished at the coming of the frost which chilled her blood within her and kept her torpid till the warm south winds of spring awoke her from her long sleep.

When quite a little boy, the writer used to go away alone into a closet, to learn his lesson. The blinds at the only window in the room were always closed, giving barely light enough to read, when sitting on a stool beneath it. One spring day a Wasp came between the blind and the glass, and after much buzzing and much walking about, began to build. She first laid down, beneath the under edge of the upper sash, a patch of paper about a third of an inch in diameter; then, standing on this, she raised cup-shaped edges all about her,

increasing outward and downward, like the cup of an acorn, and then drawing together a little, until a little house was made just about the size and shape of a white oak acorn, except that she left a hole in the bottom where she might go in and out.

Then she began again at the top, and laid another cover of paper over the first, just as far away as the length of her legs made it easy for her to work. Now it was clear that she made the first shell as a frame or a scaffold on which she might stand to make the second. She would fly away, and after a few minutes come back, with nothing that could be seen, either in her feet or in her jaws. But she at once set to laying her paper-stuff, which came out of her mouth, upon the edge of the work she had made before. As she laid the material she walked backward, building and walking, until she had laid a patch a little more than an eighth of an inch wide and half or three-quarters of an inch long. When laid, the pulp looked like wet brown

paper, which soon dried to an ashen gray, and still resembled coarse paper. As she laid the material, she occasionally went over it again, putting a little more here and there, in the thin places; generally the work was well done the first time.

So the work went on. The second paper shell was about as large as a pigeon's egg; then a third was made as large as a hen's egg; then another still larger. After a time the wasp seemed to go inside to get her material, and it appeared that she was taking down the first house, and putting the paper upon the outside. If so, she did not bring out pieces and patch them together as a carpenter, saving of work, would do, but she chewed the paper up, and made fresh pulp of it, just as the first was made. Of course the boy did not open the window, for he was too curious to see the work go on, and then he was afraid of the sting. How large the nest grew he never learned, for he soon after left the school, and saw no more of it. The Algebra and Latin which he learned

that term were soon forgotten — he was really too young to study either, then — but he has not forgotten how the Wasp made her nest.

But he now knows pretty nearly what the Wasp did after his oversight of her ceased. She made the nest about as large as a goose egg, hanging with the broad end up, and with a hole as large as one's little finger at the bottom. She took out of the inside all but two or three thicknesses, and then she built paper combs in the vacancy. These paper combs were not made like the combs of the honey bees, standing upon edge, with the cells opening in the sides, but were hung to the top, with the cells opening downward. She made first a stout post or rope of paper, hanging from the centre of the room. To the end of this rope she fastened a floor, which she spread out flat and level until it nearly reached the sides of the room. Underneath this floor, which might quite as well be called a roof, or a ceiling, she made a number of cells, and laid an egg in each. It is not quite settled whether she builds the ce

first, and then lays the roof over them, or whether she makes the roof first, and then places the cells under it; probably the two parts are made nearly at the same time.

As soon as the first eggs are hatched, the cares of the mother Wasp increase, for now she has a hungry family to feed. She must supply their wants, enlarge their cells, make more cells, lay more eggs, make additions to the house, and all together. Was ever poor human mother, left to bring up a family alone, more driven with work? In due time the older grubs are full grown, stop eating, and spin a silken cover over their cells. After a short season, having passed from grubs to pupæ, and then to perfect Wasps, they come forth. They take the heavy work upon themselves, and the toil goes merrily on. Day by day their numbers increase, and soon the mother Wasp has nothing to do but lay eggs in the cells which her children have made.

When the first tier of cells is full, another is made below it. Several pendant cords

similar to the first, are fastened to various points of the tier above. Cells are hung upon them as before, and continually increased in number, until the several parts unite to form a second complete tier. The mouths are placed downwards, and the roof serves as a floor on which the Wasps walk when taking care of the young brood. As among the humble-bees, the first Wasps that come out are workers. The males and females are not seen until autumn. A large nest may contain seven or eight thousand cells, and each cell is occupied, on the average, by three tenants in succession. All the young grubs have to be fed; not with honey, as young bees are fed, but with animal food, usually flies. We can easily see that a good sized Wasp's nest, or vespiary, may be quite a serviceable thing about the house, if, in the end, the Wasps do not become the greater nuisance.

Mr. Wood says he has seen pigs, covered with flies, lying in the warm sunshine, and the Wasps pouncing upon them and carrying them

off. It was a curious sight to watch the total indifference of the pigs, the busy clustering of the flies, which actually blackened the hide in some places, and then to see the Wasp just clear the wall, dart into the dark mass, and retreat again with a fly in its fatal grasp. On the average, one Wasp came every ten seconds, so that the pig-sty must have been a valuable store house for them.

The Wasps are hearty eaters, as well as their grubs. They prey upon other insects, sugar, meat, honey, and fruit. Indeed, they are particularly fond of ripe fruit, and always select the finest specimens, just when they are in their best condition, gnawing holes in them, and spoiling them for the table. Still it may be a question whether the good they do in destroying flies and young caterpillars does not more than pay for all the fruit they eat.

The nests of the paper-making Wasps usually vary from six to twelve inches in diameter. They sometimes become very much larger. A nest is preserved in a museum in Oxford, Eng-

land, which fills a glass case four feet high, by two feet in width. It is turnip shaped, with a large knob at the top by which it hangs. This nest, when found, was about five inches in diameter. It was taken into a house, and hung near a window which gave the builders free passage to the open air. There was no danger in this, as the common Wasp has a much better temper than the hive bee, and is by no means as capricious in the use of his sting. Their captor was disposed to give them every means of living, and supplied them daily with sugar and beer. They consumed daily a pound of sugar and a pint of beer. With plenty to eat they increased rapidly, and the nest grew as fast. In the chamber above, two other nests had been placed, and as those workmen were not fed, when they found that their kinsmen below were faring so sumptuously every day, they deserted their own houses, and joined the colony on the ground floor.

The Chartergus Wasp of Ceylon, another paper maker, uses its nest as a permanent

home, the same family living in it from year to year. This home is enlarged in a way which keeps its shape, and allows farther increase without trouble. The walls are shaped like the sides of a cow bell. The tiers of cells extend from side to side, like the regular floors of a house. When the house is full, another set of cells is built beneath the lowest floor, the wall is lengthened down as far, and a new floor is made to shut up the bottom; so that the new house is the old one with a new story *under*. In fact, probably all the Wasps learned to build by reading Gulliver's Travels. The bells of this Wasp are usually about a foot long; one is described which was six feet long, and of corresponding width.

A South American Wasp has been called *Myrapetra*. It builds a nest of a dark, blackish brown substance, like *papier mâché*. The outside of the nest is thickly studded with projecting spikes or thorns. Their exact use is not known; some have thought that they are to protect the nest from wild beasts;

others suggest that they are meant to conceal the entrances. The tiers of cells are not flat, but shaped like inverted bowls; the dishes grow broader and flatter towards the bottom of the nest.

The other branch of the Wasp family includes the Mud-diggers, or Dirt-daubers. Up in the attic of any old house in our country, east or west, the children will often find, stuck on the walls and rafters, lumps of mud of various sizes and shapes. Some are as thick as one's finger, others as large as one's fist. If one of these shapeless lumps be opened carefully, it will be found to be a mass of cells, each lined with a thin coat of brittle, shelly substance. The builders of these cells are commonly called mud Wasps. When one of these masons has chosen a place, and has begun to work, she brings in her jaws a lump of soft mud. It is not certain where she got it — whether she gathered some dust and moistened it with the liquid of her mouth, or,

as some think, she gathered it where the earth is softened by the wash of the sink. At any rate, she has kneaded it perfectly, and she spreads it as easily as the mason lays his mortar.

Mr. Gosse watched a Dauber, and tells some curious things about her. The first cell was nearly done; the Wasp had just closed the mouth. While gone for more, a pin was thrust through the mud into the cell. When the Wasp came, she laid her mortar over the hole, spreading it very skillfully and evenly. When gone again, the pin made another hole, which she closed up; and so for several times. Finally Madam Wasp got angry, and began to buzz about, trying to catch the house-flies which were near. She seemed quite certain that they had done the mischief, and waited after she had laid more mortar, as if expecting to "catch them at it." Then Mr. Gosse broke off a large piece of the side and bottom, showing the grubs, and the small spiders which she had tucked in for her children's food. This breach

she repaired as quickly as possible, in two or three loads, laying the mud all round the hole, and closing up at the middle.

Presently she began to build another cell, and again she found trouble. A tin-tack was placed in the mud, just where she would lay the next load. When she came back, she seemed quite "bothered;" she ran back and forth over the cells for some time, with the mud in her jaws, at a loss what to do. A hole she could stop up, but here was something in the way. If she should lay the mortar in its place, the tack would be more firmly fixed. If she should place it elsewhere, it would be wasted, or might do harm; if she would try to remove the evil, she must lay down her burden. At length she seized the tin-tack in her jaws and pulled it out, dropping the mud as she did it. Next time she went away, a bit of worsted was pressed into the mud, which made still more serious trouble, as the bit which she could seize would yield without coming away. Still, by takin

hold of the different parts, one after another, and tugging at them a long time, and by walking round and round with it in her mouth, she at length pulled it out.

The Dauber Wasp builds the walls of the cell, and lays an egg. Then she finds some spiders of a beautiful green species, and puts them in, bringing them very carefully in her jaws and feet. These she walls up with the egg, and the grub, when hatched, eats up the soft parts of the abdomen.

When autumn comes, the Wasps seek for hiding places in the crevices of houses, where they may pass the torpid months. Sometimes they crawl away where their presence is not desired — into clothing, and between sheets. An acquaintance had a beautiful black pointer dog, named Don. Don had a great dislike for black Wasps, and when they began to creep about, looking for their hiding places, he killed very many of them. He would draw back his lips from his teeth, so that they might not sting him, and then snap them in his teeth, throwing

them quickly on the floor. If the Wasp writhed or crawled, another and another snap was sure to follow, until the crushed insect showed no more signs of life.

A large and fierce variety of Wasps is called the Hornet. Its sting is very venomous, and its temper none of the best. It will follow a person, single handed, with great perseverance, when its wrath has been provoked.

Another very tetchy and hot tempered little thing, is a smaller variety, known to school boys as Yellow Wasps. They are usually quiet enough when undisturbed, but woe to the foolish boy who throws a stone, or thrusts a stick into their paper house. The angry swarm issues forth; they buzz about the ruined nest for a moment, and then, discovering the author of the mischief, they fly in solid column to avenge the wrong. If the unlucky urchin has not speedily taken himself far away, he will have good cause to repent an injury to a quiet and unoffending, if not inoffensive, community. These fellows do not give any warning, like the

honey bee, but true as an arrow to the mark, they go straight at you, and ear, eye, cheek, lip — the part hit, suffers. The best course for the boy is to pocket the affront, and put some aqua ammonia, also called spirits of hartshorn, on the wound. Better still, let the Wasps alone in the outset. If it is necessary to remove them, put a wisp of straw on the end of a pole, and burn them out at nightfall. If it is desired to remove a nest with the inhabitants, for study, the Wasps may be quieted with chloroform, applied at the bottom of the nest, by a bunch of cotton.

THE MIGRATORY LOCUST.

GRASSHOPPER LAYING EGGS.

About Locusts.

ARTICULATA — INSECTA.

ORDER — *Orthoptera*. Straight-winged.

FAMILY — *Locustidæ*. Locust-like.

LOCUSTS and Grasshoppers belong to the same order, and few but naturalists know the differences between them, or are able to distinguish the species of either. They have the same general shape — a long body, stiff, folded, fan-like wings, under straight, hard wing-covers, a head not unlike that of a horse, and long legs, the last pair having long and very strong thighs, with which they leap very far. The Arabs say that the Locust was

made of scraps of all animals. That it has the head of the horse, the horns of the stag, the eye of the elephant, the neck of the ox, the breast of the lion, the body of the scorpion, the hip of the camel, the legs of the stork, the wings of the eagle, and the tail of the dragon. The wings of some are spotted, and the spots have been supposed to foretell future events.

Locusts have been counted among the most fearful plagues which have ever punished a nation. In Eastern lands they have appeared in astonishing numbers; their swarms have darkened the sun; they have eaten every green thing, leaving the land behind them black as if burned with fire. They are not even content with that which is green, but devour every thing which can be devoured — linen, woolen, silk, leather, the very varnish of the furniture.

In 1748 the locusts appeared early in June in Hungary, on the Danube. In July they were terribly destructive throughout Poland, and at the middle of August they appeared in clouds in London. In one night they ate the

grass and the foliage of trees about Vienna, making the forests bare as brooms. In Poland they covered the country for miles, and were heaped up a foot thick; when they alighted they covered the ground like falling snow. At Warsaw soldiers were sent out against them with cannon. The firing of great guns scattered them and drove them away. In Italy the government offered rewards for them, and 12,000 sackfuls were gathered, cast into pits, and covered with quicklime.

The prophet Joel gives a description of their coming, both sublime and accurate: "A day of darkness and of gloominess, a day of clouds and of thick darkness, as the morning opened on the mountains; a great people and a strong. A fire devoureth before them, and behind them a flame burneth. The land is as a garden of Eden before them, and behind them a desolate wilderness; yea, and nothing shall escape them. The appearance of them is as the appearance of horses, and as horsemen shall they run. Like the noise of chariots on the tops of moun-

tains so shall they leap; like the noise of a flame of fire that devoureth the stubble, as a strong people set in battle array. They shall run like mighty men; they shall climb the wall like men of war. And they shall march every one his ways, and they shall not break his ranks; neither shall one thrust another. They shall walk every one in his path, and when they fall upon the sword they shall not be wounded. They shall run to and fro in the city. They shall run upon the wall. They shall climb up upon the houses. They shall enter in at the windows like a thief. The earth shall quake before them; the heaven shall tremble; the sun and moon shall be dark, and the stars shall withdraw their shining."

The prophet also mentions the usual way in which the locusts are destroyed: "I will remove far off from you the northern army, and will drive him into a land barren and desolate, with his face toward the east sea, and his hinder part towards the utmost sea, and his stink shall come up because he hath done great

things." This prophecy may refer to the coming of an army of human beings, but the description literally applies to the march of these insects as described by historians. Mr. Barron says that in 1784, and in 1797, two thousand miles in South Africa were covered with Locusts, which, being borne into the sea by a northwest wind, formed, for fifty miles along the shore, a bank three or four feet high; and when the wind was in the opposite point, the horrible odor from them was perceptible a hundred and fifty miles away.

Most scourges bring in their train benefits which fully repay, if they do not many fold surpass, the injury inflicted. The prairies rejoice in a greener verdure after the fire has consumed the withered grass. So a land which has been choked with rank shrubs and withered bitter grasses, after it has been swept by the Locusts, soon wears a more beautiful dress, with new herbs, superb lilies, fresh annual grasses, and young and juicy shrubs, which afford sweet pasture for wild cattle and game.

Locusts are eaten by all sorts of quadrupeds, by many birds, large and small, and even by man. In the countries which they ravage, the people have nothing else left to eat, and learning from necessity, they continue to eat Locusts from choice. The Arabs boil them and dry them in the sun. Others soak them in oil. In other places they are gathered in heaps and salted. The wings are taken off, and the bodies eaten as meat, or they are dried, ground, and made into bread. They have even been exported, and armies have been relieved by them. The African Bushman delights in a swarm of Locusts, as his choicest game, furnishing plenty of food without having to work for it. He makes large fires, and the Locusts, flying through the flame, have their wings scorched, fall into the fire, are roasted and eaten. Those that remain are ground between stones, and kept for another meal. Europeans dislike them, but the fault is probably in the cooking; Dr. Livingstone thinks them very good eating when well prepared.

Honey is eaten with them, when it can be had, as it assists digestion.

Does this remind us of John the Baptist, whose "meat was locusts and wild honey." It has been questioned whether the quails which the strong east wind blew together for the Israelites in the desert, were not truly Locusts; there is doubt whether the word translated quail had ever that meaning. The Jews ate Locusts, and distinguished between such as were clean or unclean.

The young Locusts do not pass through the several changes which most insects undergo. The bee, for example, is first a grub, then a chrysalis, then a perfect, winged bee. The Locust comes from the egg a Locust, but wants wings, which come gradually. The eggs are laid in the ground. The female pierces the ground with a long, two bladed, hollow instrument. When it is forced into the soil, the blades open a little, and press the earth aside, while a dozen eggs are passed into the cavity then formed. The contrivance is not unlike a

corn-planter, which makes a hole, drops the corn, and covers it, all at once. The Locust goes about thus, planting her eggs, until she has deposited several hundred. They remain during the winter, and until the warm sun next summer hatches them, bringing out little creatures as large as gnats. These stay a while in the nest, and in the ground near by, and then come forth, hopping about without wings. As they grow they shed their skins, each time appearing in a new, larger, and more perfect dress. By the third or fourth change, wings begin to appear, and by the sixth they are full fledged. The common Grasshoppers make their entire growth in one season, but the terrible migratory Locust, which has been mentioned above, is said to live in the ground two years, and come forth in the third.

It is often a matter of surprise that insects like the Locusts, the chinch-bugs, and others, should not be observed for many years, and then should appear in swarms of such immense numbers, and do such terrible mischief. Many

attempt to account for this by supposing that the ground has some hidden power of spontaneous production, which is thus fitfully exerted It is probably the fact that these insects never entirely disappear; that no season passes without producing enough to keep up the succession. They are exceedingly productive, so that a few may be the parents of a multitude. But the dangers which surround the eggs and the young, eaten as they are by every kind of bird and insect, and destroyed by myriads by unseasonable cold and rain, sweep them away, and leave only a remnant for seed. If only one in a thousand escapes, that one will reproduce a thousand. Thus if two favorable seasons follow in succession, the scourge appears, and the crops suffer.

In the south of Europe rewards are regularly paid for the collection of Locusts and of Locusts' eggs. The city of Marseilles expended 20,000 francs for that purpose, in one year. A franc is paid for about two pounds and a quarter of eggs. In Italy large quantities have been

gathered and thrown into the streams. There is a slight difference in the piercer of the Locust and of the Grasshopper, but the method of placing the eggs in the ground is essentially the same.

One of the most noted among the Grasshoppers is the Katy-did. This insect is of a pale green color; its head seems to have been squarely chopped off; its wing-covers are rounded, and enclose the wings and body like the sides of a pea-pod. It lives in the branches of trees, and does not lay its eggs in the ground, but deposits them upon the twigs and branches in regular rows. The song of the Katy-did is one of the cheerful sounds of autumn, save that from constant repetition it becomes tiresome. It is not truly a song, for it is not made by the mouth.

"The musical organs of the male consist of a pair of taborets. They are formed by a thin, transparent membrane stretched in a strong, half-oval frame in the triangular overlapping part of each wing cover. During the day they

are silent, but at night the males begin the joyous call by which they enliven their silent mates. This proceeds from the rubbing of the taboret frames against each other when the wing covers are opened and shut; and the notes are repeated for hours together. The sound may be heard in the stillness of the night to the distance of a quarter of a mile. At the approach of twilight the Katy-did mounts to the upper branches of the tree in which he lives, and, as soon as the evening shades prevail, begins his noisy babble, while rival notes issue from the neighboring trees, and the groves resound with the calls 'Katy-did-she-did, she-didn't, she-did,' the livelong night."

He put his acorn helmet on;
It was plumed of the silk of the thistle-down;
The corslet plate that guarded his breast,
Was once the wild bee's golden vest;
His cloak, of a thousand mingled dyes,
Was formed of the wings of butterflies;
His shield was the shell of a lady-bug queen,
Studs of gold on a ground of green;
And the quivering lance which he brandished bright,
Was the sting of a wasp he had slain in fight.
Swift he bestrode his fire-fly steed;
He bared his blade of the bent-grass blue;
He drove his spurs of the cockle seed,
And away like a glance of thought he flew.

The moth-fly, as he shot in air,
Crept under the leaf, and hid her there;
The katy-did forgot its lay;
The prowling gnat fled fast away;
The fell mosquito checked his drone,
And folded his wings till the fay was gone;
And the wily beetle dropped his head,
And fell on the ground as if he were dead.

They watched till they saw him mount the roof
That canopies the world around;
Then glad they left their covert lair,
And freaked about in the midnight air.

The Culprit Fay.

TRANSFORMATIONS OF THE MOSQUITO.

About Mosquitoes.

ARTICULATA — INSECTA.

ORDER — *Diptera*. Two-winged.

FAMILY — *Culicidæ*. *Culex*, A gnat.

THE Mosquito is a nuisance. He sings and then he bites; and his singing is usually notice that he intends to bite. He comes in the night, when the faint and sultry air persuades the sleeper to throw off the protecting cover, and sleep flies before him. If one seeks a shelter from the glaring sun, under the shade by the brook-side, myriads of these gauze-winged musicians warn him away from their realm. The wild forest is full of them. The

heavy timber, from June to September, is utterly uninhabitable, unless constant war is made against the Mosquitoes. Every bit of standing water, and every purling rill, teems with them. The trees and bushes every where shelter them. Shake a bough, and a swarm rises from it; land from a boat, and a cloud tender a too cordial reception. They gather like hungry politicians about the dispenser of official favors.

Nothing but thick leather and woolen will protect your ancles or your wrists. You can save your face in only one way. Wear a soft hat that you can sleep in; get a yard of black lace, sew the ends together, and draw round the crown of your hat one end of the bag which you make, while you gather the other end under your chin. The brim of the hat will keep the veil from the face, and the disappointed Mosquitoes will rave in vain against the outside. In a few moments one becomes so accustomed to the veil that it does not interfere with sight, although it is in the way in eating and drinking. It is no exaggeration to say, that in the dense forest, in June,

the Mosquitoes have gathered upon the back of a man sitting down to rest, so thickly as to hide the color of his coat, whether light or dark, with the brown of their wings.

The Rev. Walter Colton tells how the miners in California made culprits disclose the truth by means of Mosquitoes. A rogue had stolen a bag of gold and hid it. Neither persuasions or threats could make him tell where it was concealed. He was sentenced to receive a hundred lashes, but was told that he would be let off with thirty, if he would tell what he had done with the gold. He refused. The thirty lashes were laid on, but he was as stubborn as a mule. He was then stripped, and tied to a tree. The Mosquitoes, with their sharp bills, went at him, and in less than three hours he was covered with blood. Writhing and trembling from head to foot, he exclaimed, "Untie me, untie me, and I will tell where it is!" "Tell first," was the reply. So he told where it might be found. Then some of the party, with wisps, kept off the hungry Mosquitoes, while others

went where the culprit directed, and found the bag of gold. He was then untied, washed with cold water, and helped to his clothes, while he muttered, as if talking to himself, "I couldn't stand that, anyhow."

There is no doubt that a man would perish in a short time, from loss of blood, and from the fever caused by the poison of their bites, if exposed, as this man was, with no means of defence.

The largest kind of Mosquito about the Mississippi river is called the "Gallinipper." The boatmen say that it is as large as a goose, and that it carries a brickbat under its wing, on which to sharpen its bill.

Cattle are not troubled by Mosquitoes, but horses suffer terribly. The lumbermen drive them away from their camps by making low fires of chips and damp grass. In the coolness of evening, the smoke from these "smudge" fires hangs heavily over the ground, and affords considerable protection, which even animals seek.

On a still night such a camp is very picturesque. The low log hut by the river; the tall, sombre pines, towering above dense masses of maples, and ragged outlines of oaks; the straggling fires, that thrust out tongues of fitful flame, and reek with thick smoke, which spreads upon the ground, or lazily rolls over the roof; the long, level lines of blue haze which the smoke finally draws against the foliage of the trees; the solemn stillness resting over all, broken only by the hoot of the owl, the wail of the whip-poor-will, or the tinkle of the rippling stream, while the bright eyed climbing stars replace the waning twilight; compose a scene too lovely to be spoiled by millions of myriads of swarming, howling, raving, hungry Mosquitoes.

The Mosquito is an insect of the water. Early on a summer morning, even before sunrise, the mother may be found laying her eggs. They must be placed where there is warmth enough to hatch them, and where the young creatures which pop out may go at once into

hairs, which spread in a star-form, and are oiled, to repel the water. Thus the tail is both nose to breathe through, and buoy to keep itself at the top of the water. He lives upon the impurities in the water, and so serves a very useful purpose in the world.

By and by, he changes into a pupa, and then he turns himself over, end for end. He did breathe through his tail; now he breathes through his ears, or a pair of tubes which look like ears, and are thrust up, just a little, out of the water. His tail is now like the tail of a fish, and by it he can move himself through the water as he pleases. He remains thus about fifteen days, and then takes a new form, exchanging his home in the water for a life in the air.

When the warm sun shines on the water, the change comes. The pupa rises to the surface, and thrusts out his head and shoulders. The cover bursts, and the plumed head appears, followed by the shoulders, and the filmy wings. Now is the time of danger. If an unlucky puff

of air sweep the water, over goes our sailor, his wings are wet, and his voyage lost, just as he is ready to come into port. His old garment lies upon the water. It is his life-boat. His body is the mast, and his drying wings are the sails. Now his slender legs are dry, and with them he feels for the surface of the pool. He lifts himself free from his cast-off coat, rests an instant on the water, and then leaps into the air, a singing, stinging Mosquito.

But all the Mosquitoes do not sting. The males wear a pair of plumes upon their heads, and spend their days in a ceaseless dance in the sunbeams. Those that bite are the females. One gently drops on your neck or hand, with footstep so light that you feel it not; she looks about for a moment, hesitating as to where she will begin to bore. Now she has found the place, and her needle tongue goes down into the skin. Now you feel the prick, and now you may see her chest heave as she pumps up the red fluid. No speculator, boring for oil, ever felt happier over a flowing well, than our

borer over the flowing fountain which she has tapped. Now her abdomen expands, more and more, until it seems that she will burst. At last she has enough — too much, in fact, for her greed will cost her life. She draws up the rod, and heavily flies away. Her light wings can scarcely bear the increased burden. She will die of surfeit.

TO A MOSQUITO.

Fair insect! that, with thread-like legs spread out,
And blood-extracting bill and filmy wing,
Dost murmur, as thou slowly sail'st about,
In pitiless ears full many a plaintive thing,
And tell how little our large veins should bleed,
Would we but yield them to thy bitter need.

Unwillingly, I own, and, what is worse,
Full angrily men hearken to thy plaint;
Thou gettest many a brush and many a curse,
For saying thou art gaunt, and starved, and faint:
Even the old beggar, while he asks for food,
Would kill thee, helpless stranger, if he could.

Beneath the rushes was thy cradle swung,
  And when, at length, thy gauzy wings grew strong,
Abroad to gentle airs their folds were flung,
  Rose in the sky and bore thee soft along;
The south wind breathed to waft thee on thy way,
And danced and shone beneath the billowy bay.

Calm rose the city spires, and thence
  Came the deep murmur of its throng of men,
And as its grateful odors met thy sense,
  They seemed the perfume of thy native fen.
Fair lay its crowded streets, and at the sight
  Thy tiny song grew shriller with delight

At length thy pinions fluttered in Broadway—
  Ah, there were fairy steps, and white necks kissed
By wanton airs, and eyes whose killing ray
  Shone through the snowy veils, like stars thro' mist;
And fresh as morn, on many a cheek and chin,
Bloom'd the bright blood thro' the transparent skin.

Sure these were sights to touch an anchorite!
  What! do I hear thy slender voice complain?
Thou wailest, when I talk of Beauty's light,
  As if it brought the memory of pain.
Thou art a wayward being — well — come near,
And pour thy tale of sorrow in mine ear.

What says't thou—slanderer! rouge makes thee sick?
And China bloom, at best, is sorry food?
And Rowland's Kalydor, if laid on thick,
Poisons the thirsty wretch who bores for blood?
Go! 'twas a just reward that met thy crime—
But shun the sacrilege another time.

That bloom was made to look at, not to touch;
To worship, not approach, that radiant white;
And well might sudden vengeance light on such
As dared, like thee, most impiously, to bite.
Thou should'st have gazed at distance, and admired,
Murmured thy adoration, and retired.

Bryant.

SCARABÆI AT WORK.

About Beetles.

ARTICULATA.— INSECTA.

ORDER — *Coleoptera.* Sheath-winged.

KNIGHTLY armor of proof protects the Beetle. First, there is the strong helmet, with shut visor, and crest of varied device. Then comes the solid cuirass, which protects the body, and below that the full-orbed, or oval shield, which covers the abdomen, and the upper joints of the legs. He carries neither sword nor lance, mace nor battle axe, but from the joints of his visor project two ponderous jaws, which grip like a vice. He is horse and horseman in one. His

thick shield parts in the middle, and when the two leaves swing apart, they disclose a pair of light, gauzy wings, which, with a great deal of fussy buzzing, lift him from the ground and carry him away, when he,

"Drowsy beetle, wheels his droning flight."

The plates of his coat of mail fit each other very exactly. The helmet makes the neatest joint with the corselet, and the corselet with the shield. The wearer can move every part with perfect freedom, and yet each joint is closed against prick of arrow or thrust of spear. Yet the Beetle is not the swift horseman of to-day, but resembles more the heavy man-at-arms of three hundred years ago. When he was pushed off his horse in sham or real fight, and lay sprawling on his back, boxed up in his heavy plate armor, he needed a stout esquire to set him on his pins again. Just so, if a bumming beetle be knocked on the floor; it takes him a long while to overcome his astonishment,

and make ready again for a tilt at the lamp, or at your face.

Our knight has little of the swift dash of the wasp, who pricks with his sharp lance, and then rings his shrill defiance. He has none of the stealthy adroitness of the spider, who lassos his victim, like a Mexican, and then stabs him in the back, as coolly as an Italian bravo. Indeed, he does very little at offensive warfare. If you are in his way, he gives you a sharp pinch, or whacks you in the face, but that is all. His heavy mail serves mostly to ward off the assaults of others.

The style and the ornaments of his armor are very various, and often are very beautiful. Sometimes the whole suit is plain black, or dark brown. Sometimes it gleams with brilliant hues of green, crimson, purple, and gold, or blazes with precious gems, set in polished metal. In any case, he keeps his armor scrupulously clean, no matter how filthy the work which he is busied about.

The order contains over one hundred thou-

sand kinds, divided into various families. We must be content with noticing a few of the most remarkable. Some of them do great injury to vegetation, either while grubs, as the borers in trees, or the young of the cock-chaffer, which eat the roots of grass; or while fully developed beetles, as the curculio, which kills the plums, the striped cucumber-bug, the rose-chaffer, and many others. Other kinds confer decided benefits. The Water Rovers, the Skin Beetles, Carrion Beetles, and Dung Beetles, are scavengers, disposing of the filth in which they and their young live. The Tiger Beetles, Lady-birds, and Diving Beetles, prey upon caterpillars, and plant lice. The Stag Beetles, Bark Beetles, and others, help destroy old trees which are going to decay. The Blister Beetles, or Cantharides, are pounded up by the druggists, and the dust is spread upon plasters, to raise blisters when applied to the skin.

The first on our list is the Sexton, or Burying Beetle. If the body of a dead bird, or mouse, or any piece of meat, be left upon a spot of soft

earth, it will often be found, on the next morning, half sunk in the soil. Take up the bird, and you will find under it one or two beetles, sometimes entirely black, sometimes barred with orange. During the day the insects will usually be quiet, but at nightfall they will begin work again. The work of burying is done almost entirely by the male Beetle, the female either hiding in the dead body, or sitting quietly on it, and being buried with it. The male begins by turning a furrow all round the bird, about half an inch away. His head is held sloping outwards, and like a strong plow, turns the earth aside. When the first furrow is made, a second is turned within it, the dirt being thrown into the first. Then a third is made, and this is quite under the bird, so that the Beetle is out of sight. The work may be traced by the heaving of the earth, which now makes a wall, and as it grows higher, the bird sinks. After hard work for about three hours, the Beetle comes forth, and crawls upon the body, to see how he succeeds. He rests half

an hour, goes down again, dives into the grave, and pulls the bird down by the feathers. He works two or three hours more, plowing and pulling; then comes up, takes another survey, and drops down, as if suddenly fallen asleep. When he is rested, he pulls the bird about, this way and that, tramples it down, and settles it to his mind. Then he goes behind the rampart of earth, and plows it back into the grave, with great skill and strength. He bends his head down first, and then turns up his nose with a jerk which throws the earth forward. When the grave is filled, and carefully examined, no feather being left in sight, he digs a hole in the loose earth, and having already buried the bird and the female, next buries himself. The female lays her eggs, the pair take a full meal of the carcass, then dig their way out, and fly away.

If the creature is no bigger than a mouse, a single day will be long enough to bury it in. One buried a mole, forty times as large as itself, in two days. A French naturalist placed two

pairs of these Beetles under a glass case, and furnished them with dead bodies. In fifty days they had buried four frogs, three small birds, two fishes, one mole, two grasshoppers, and three bits of flesh. All this work is done to secure a nest and food for the young, and to protect it from other creatures, as the fox, or the raven, which might devour flesh and young Beetles together.

The work is done very much as men sink wells in sandy ground. They sometimes lay down on the earth a ring of plank, as large as the well is to be. Then they build a circular wall of brick and mortar upon the ring. The sand is taken out from under the plank, and the whole wall sinks slowly down. So the well is dug as deep as may be necessary, while the wall is built up at the top, as fast as it settles into the ground.

Another burying Beetle is the Dor Beetle, called, in this country, Tumble-bug. This is akin to the sacred beetle of ancient Egypt, or the Scarabæus. Its image was engraved on

rings, which soldiers wore to show that they were warriors. On temples or columns it was a symbol of Divine wisdom, which regulates the universe, teaches mankind, and is self-existent. In its singular habit of rolling about pellets of dung the Egyptian astrologers thought it represented the revolutions of the sun, moon, and stars.

When this insect finds a patch of cow-dung, she sets herself at work. First she digs a deep hole, smooth and round. Then she cuts off a portion of the patch, lays an egg in it, and rolls it about into a rude ball. Now she rests her fore feet upon the ground, and with her hind feet rolls the ball hither and thither, until the outside has gathered in the dust and sand, a thin, hard crust or shell. Then, always pushing backwards, she rolls it to the hole, tumbles it in, and covers it with earth. The egg is soon hatched, the grub feeds on the substance which surrounds it, changes to a chrysalis, and remains in the shell, which still serves to protect it, until it is ready to come forth, a perfect Beetle,

qualified to roll pills on its own account. The smooth surface of this beetle, which gleams like polished steel, retains no trace of its work. Not a spot or a stain defiles it, nor does any odor betray its occupation.

Some of these rolled cocoons are very large. A specimen in the British Museum, made by the *Goliath*, is as large as a swan's egg. The walls are quite thin, and are strengthened by a belt about the middle. The insect which grew in it is still inside, and may be seen through an opening at one end. Its plates of mail are rich, velvety chocolate, edged with broad bands of white. This species, the largest now known, has a body about four inches long and two inches broad; when walking, it covers a space of nearly six inches.

An interesting family of Beetles includes the Dors, May-bugs, Cock-chafers, and Rose-bugs. They are very common and well known, both as Beetles and as grubs. The perfect insect does not live more than a week, and the species is not seen more than four or six weeks in a

season. The females burrow in the ground about six inches, to lay their eggs — some say, as many as two hundred. In about fourteen days the eggs are hatched, and produce white grubs, each having six legs near the head, and a pair of strong jaws. Their skins are white, and partly transparent. When thrown out by the plow or spade, they are found coiled like a ring, or a horse-shoe. A full grown grub is nearly as large as one's little finger — a plump, fat morsel, very eagerly swallowed by crows and chickens.

They do much mischief, eating the tender roots of grass, grain, herbs, and trees. When very numerous, they have so cut off the roots of grass, that the turf could be rolled up in many places like a carpet. As winter comes, they descend below the reach of frost, and lie torpid until spring; then they change their skins, and go back to the surface. At the end of the third summer — some say the fifth — they go down about two feet, and each one, by moving from side to side, forms a hollow oval

space, about the size of a pigeon's egg. Here it casts its skin, and becomes a pupa, whose clear salmon-colored skin shows under it the head, eyes, jaws, wings, legs — all the parts of the perfect beetle. In February this skin bursts, and the insect is ready to dig its way out when the first warm week of May has clothed the trees with leaves. In digging out decayed stumps of trees, fine opportunities may be had for observing these grubs in every stage of their lives.

The winged beetles do as much harm by eating the leaves of trees, as the grubs did by devouring the roots. During the day they remain on the branches, hidden under the leaves. At nightfall they begin to buzz about, humming among the trees until midnight. They often come into houses, attracted, and blinded, by the light. They dart about with very uncertain aim, putting out candles, whacking unlucky people in the face, and banging against trees and walls so hard as to throw themselves stunned upon the ground. Hence come

the sayings "blind as a beetle," and "beetle-headed." When very plenty, the attempt has been made to check their ravages by shaking them from the trees upon cloths spread underneath. They are then thrown into boiling water, and fed to fowls or hogs. In this way they have been gathered by pailfuls, and in a few days no more could be found. Many years ago these beetles were so plenty in Norwich, England, that a farmer and his men claimed to have gathered eighty bushels of them; and they and their grubs had done so much harm, that the city gave the farmer twenty-five pounds for relief.

The Rose-chafer, like the May-bug, does much harm in gardens and nurseries. It is about one third of an inch long, covered with yellowish down. The slender, red legs end in long feet. They come forth about the second week in June, and remain about a month. The eggs are hatched in the ground, and the grubs feed upon roots until autumn, when they descend below the frost. In the spring they

come up again. In May they pass the first change, and in June come forth fledged Rose-bugs. They can be destroyed only by crushing, burning, or throwing into scalding water. They eat the leaves not only of rose bushes, but also of fruit trees.

Certain Beetles called Stag Beetles, and Horn-bugs, from their jaws, which resemble the horns of oxen or deer, belong to the family *Lucanidæ*. They fly by night, and often the lights attract them into houses, to the great alarm of the people within; but they are quite harmless, and will not even pinch, unless provoked. Their grubs resemble those of the Scarabs, and live in the trunks and roots of trees. When full grown, they make cocoons of bits of wood and bark, glued together, and wait the changes which make Horn-bugs of them.

The grubs of the *Buprestidæ* are the borers so destructive to fruit and forest trees. They are long, narrow, and flat, with large, hard heads and jaws. They have no legs, but

move by twisting from side to side, and by pulling with their jaws. They may be destroyed by thrusting a wire after them, into the hole which they are making — if it can be found. The crushed grub will come out on the point of the wire, to prove the success of the experiment. Possibly, however, woodpeckers would be more expert at this kind of thing than men.

Another family that are great pests are the *Curculios*. These spoil the fruit, attacking plums, apricots, and cherries, and not sparing apples, pears, and peaches. As soon as the fruit is set in the spring, these little insects begin their work, and they keep at work, until July or August. The Beetle cuts with its snout a little curve in the skin of the plum, then turns round and lays an egg in the wound. A maggot hatches, which eats its way into the fruit, even to the stone; this causes the plum to become diseased, and to fall off before it is ripe. When the plum is partly grown, the curved scar may be easily found. All such,

with all that fall upon the ground, should be gathered and destroyed, to prevent the maggots from going into the ground to pass the changes, and coming out afterwards to keep up the evil.

Others of this family attack the pines. Wilson says: "Would it be believed that the larvæ of a fly no bigger than a grain of rice, should silently, and in one season, destroy some thousands of acres of pine trees, many of them two and three feet in diameter, and a hundred and fifty feet high! In some places the whole woods, as far as you can see around you, are dead, stripped of their bark, their wintry arms and bare trunks bleaching in the sun, and tumbling in ruins before every blast." Besides boring into the trunks, these insects often destroy the top shoot of the tree, on which its straight and lofty growth depends. Mr. Wilson suggests that until farmers can devise some better plan of killing these pests, they had better thank and protect the woodpecker.

Another rascal of this tribe is the wheat-

weevil. Several insects are known by this name, but the one meant is a slender Beetle, about one eighth of an inch long, and of a pitchy-red color. It lays eggs upon the harvested wheat, and the grubs burrow into the grain, each one taking possession of a single kernel. The worm eats the substance, but leaves the shell, so that the only evidence of harm is the lightness of the grain. They may be destroyed by drying the wheat in kilns.

After the peas have blossomed, and while they are just beginning to swell in the tender pods, the Pea-beetles gather by night, or in cloudy weather, and lay their tiny eggs in minute holes which they pierce in the surface of the pods. The maggots, as soon as hatched, bury themselves in the peas, and the small holes are soon closed. Often every pea in a pod contains a grub. They remain in the peas after they ripen, and come out in the spring, perfect bugs, ready to carry on the work. Those who plant "buggy" peas will find the bugs are quite as sure to come up, and bear

fruit, as the peas. The crow-blackbird is fond of the bugs, and the Baltimore oriole, or hang-bird, splits open the pods to get the grubs in the green peas. Don't disturb him, for be sure if he wants the peas, you don't.

Another nuisance in the garden is the yellow striped bug, which destroys the young cucumber and melon plants. It comes as soon as the young vines come, and it stays all summer. Great numbers visit the flowers of the squashes and pumpkins for the pollen. The eggs are laid, and the grubs grow, in the ground. Those bugs which have their heads pinched off will be sure to do no further harm. Various devices have been employed against them, such as sifting soot, snuff, sulphur, ashes, or plaster of Paris, on the vines; sprinkling them with steeping of tobacco, red pepper, walnut leaves, or hops; burning fires of pine knots or bits of tar barrels at night, but none are sure. The best preservative is a frame of board, covered with millinet, to place over each hill of vines. If the plants can be protected for a little time,

they will grow fast enough to escape further harm.

But my readers will begin to believe that all the Beetles are nuisances, and will be led to make war upon every insect which wears a hard shell. Let us find some for which something may be said on the credit side of the account.

While writing about ants, we mentioned those destructive little insects, which the ants use like herds of cattle, the plant-lice, or *Aphides*. The ants only milk their cows, but the grubs of a Beetle eat them up. These grubs become the pretty insects which people commonly call Lady-birds; naturalists call them *Coccinellidæ*. They have the size and shape of half a pea. Some are black, spotted with red; others, red with black, yellow with black, or yellow with white spots. The eggs are laid among the lice, and the grubs at once go to work catching and eating prey as large as themselves, without ever seeming to be satisfied.

This insect has always been a favorite. The

German children think it brings fair weather, and the English boys and girls are afraid to hurt it, lest it should bring rain. The Norwegians call it Marspäert, and count the spots to see if there will be a good harvest. If there be fewer than seven spots, they say bread will be plenty and cheap. The children sing:

Marspäert, fleeg in Himmel!
Bring my'n Sack voll Kringeln; my een, dy een,
Alle lütten Engeln een.

Marspäert, fly to heaven!
Bring me a sackful of biscuits; one for me, one for thee,
For all little angels one.

The Scotch children call this insect Lady Lanners, or Landers. They say:

Lady, Lady Lanners,
Lady, Lady Lanners,
Tak' up your clowk about your head,
And flee away to Flanners.
Flee ower firth, and flee ower fell,
Flee ower pule and rinnan well,
Flee ower muir, and flee o'wer mead,

Flee ower livan, flee ower dead,
Flee ower corn, and flee ower lea,
Flee ower river, flee ower sea,
Flee ye east, or flee ye west,
Flee till him that lo'es me best.

There are many other little rhymes in various languages, which show how children every where love this insect. Perhaps they do not know that it is useful as well as pretty.

The family of *Cicindelidæ* are called Tiger Beetles, or Sparklers. They get the first name from the fierce way in which they seize and devour other insects, and the last from their brilliant colors. The Tiger Beetle is among insects what the kite is among birds, or the shark among fishes. He runs with great speed; he is armed with jaws like sickles, crossing each other; his eyes project from each side of his head, that he may see every way; his wings help him to fly as swiftly as a wasp. His suit of mail, of burnished steel embossed with gold, is more beautiful than any thing ever wrought by mortal armorer. If placed under the micro-

scope in a strong light, his whole surface seems ablaze with precious metals and dazzling gems. The larvæ make their homes in the ground in tunnels about a foot deep. Here one of them lies in ambush just at the top of the ground, the head hooked to the edge of the hole. When an insect passes, the jaws grasp it, and drag it to the bottom of the den, to be eaten.

Another family of carnivorous Beetles lives in the water. Their breathing tubes open under the wing-cases. When they dive, they carry down under the wings a supply of air, and as this becomes exhausted, they rise, lift the wings above the surface, and so take a fresh supply. The larva of the Water Beetle is as active and as fierce as that of the Tiger Beetle, and the full grown insect does not outgrow his youthful tastes. If several be put in a vessel together, they will surely eat each other. A gentleman placed a pair in his aquarium in order to observe their habits. He succeeded in observing, on the next morning, that the male

had been killed and partly eaten by his disconsolate widow.

The whirligigs, that shoot from side to side on the top of still water, belong to this family.

One of the most noted Beetles is the Cucuyo, or Fire-fly of Mexico and Brazil. It wears on each side of the chest two light patches, which by day are pale yellow, but by night glow with a very intense light. When it spreads its wings, its whole body seems filled with the most brilliant flame. It flies by night, and the forests, filled with these insects, crossing and recrossing in every direction, glowing and vanishing as if suddenly lighted and as suddenly extinguished, present a scene too beautiful to be described.

The Indians catch these beetles by balancing hot coals in the air at the end of a stick, to attract them, which proves that the light which their bodies diffuse is to attract. Once in the hands of the women, the Cucuyos are shut up in little cages of very fine wire, and fed on fragments of sugar-cane. When the Mexican ladies wish to adorn themselves with these living dia-

monds, they place them in little bags of light tulle, which they arrange with taste on their skirts. There is another way of mounting the Cucuyos. They pass a pin, without hurting them, under the thorax, and stick this pin in their hair. The refinement of elegance consists in combining with the Cucuyos, humming-birds and real diamonds, which produce a dazzling head-dress. Sometimes, imprisoning these animated flames in gauze, the graceful Mexican women twist them into ardent necklaces, or else roll them round their waists, like a fiery girdle. They go to the ball under a diadem of living topazes, of animated emeralds, and this diadem blazes or pales according as the insect is fresh or fatigued. When they return home, after the *soirée*, they make them take a bath, which refreshes them, and put them back again into the cage, which sheds during the whole night a soft light in the chamber. In the full glow of one of these Fire-flies, it is easy to read a letter or a book. The little Flies which dart

through our meadows in moist summer evenings, are akin, though far less brilliant.

The last family we will mention, are the *Cantharides*, or Blister-flies. They secrete a substance which, when procured by itself, looks like fine snow-flakes; when it is left upon the skin it causes great irritation, and soon produces blisters. The Spanish Fly is nearly an inch long; its color is a satin green, glossed with gold. It feeds upon the ash and lilac, and is found also on the poplar, the rose, and the honeysuckle. Large quantities are taken, killed by fumes of vinegar, and exported for druggists' use. Several kinds of Blister-flies live among us. The Potato-fly, which consumes the vines at midsummer, is of this family. Another often strips the leaves from the clematis. These flies may be caught by shaking them from the vines into water, which prevents their flying, and when dry they may be used by the apothecaries.

AMPHRISIUS BUTTERFLY, CATERPILLAR, AND CHRYSALIS.

About Butterflies.

Articulata — Insecta.

Order — *Lepidoptera*. Scale-winged.

UGH! See that horrid, ugly worm!" Who has not heard such an outcry? Is there any good reason for the feeling which it indicates? We believe that the repugnance which very many really feel towards creatures of this kind is not, as they think, natural, or inborn, but is the result of early training. When the young mother sees her toddling baby busily watching a caterpillar, she bids him, with earnest words, with looks and accents of disgust, avoid the "horrid, nasty

thing;" his growing curiosity is checked, and darling Willie Winkie comes to believe that a worm or a spider is the vilest thing he can know, as confidently as he believes he loves his mother or his sister. Whoever has overcome the feeling, thus artificially acquired, long enough to begin the study of the forms, the nature, and the wonderful transformations of caterpillars of every kind, has learned that in this, as in all other departments of nature, the infinite resources of the creative power of God are wonderfully displayed.

Considering the entire round of the creature's life, the whole world of birds, insects, and flowers presents nothing more interesting or lovely. If nature's course is not disturbed, the worm will fly on wings of beautiful form, exquisite coloring, and most delicate plumage; the moth or the butterfly assuredly was, at some day not long since, a crawling worm. But we go yet farther, and confidently assert, that at no stage of its varied life does the insect show to the student so much that has interest or value, or

to the general observer much more of absolute beauty of color, symmetry, and adaptation, than when it is so often abhorred as a "horrid, ugly worm."

We do not deny that caterpillars of all kinds do much mischief. They eat, eat voraciously, and have the instinct to select the choicest parts of that on which they thrive. Most subsist on vegetable food, and chiefly on leaves; yet some devour the solid wood, some live in the pith, and some eat only grains and seeds. Some kinds attack woolens and furs; even leather, meat, wax, flour, and lard, nourish particular kinds of caterpillars. There is, then, no reason why they may not be destroyed, so that their numbers may be kept within reasonable limits. But we should not assert that the poor creatures are ugly, and then kill them because we have given them a bad name.

Let us see what we can learn by studying the lives of a few; we could wish that every reader, young or old, could have the specimens under

his own eyes, sure as we are that he would find more of interest in them than we describe.

In the month of June, when the feathery carrot leaves are growing well, we may find feeding on them a small worm, nearly black, which has perhaps grown to half an inch before we discover him; he may be no more than a tenth of an inch long. If none are seen on the carrots, we may search the parsnips, the leaves of the celery, parsley, or carraway, for the worm thrives on either. He is about as large as an oat-straw, and a little thickest just behind his head. He wears a clean, tight-fitting coat of black velvet, with a broad white band across the middle of his back, and another over his tail; the velvet seems to be laid over him in folds, and to be studded with small black points. If touched, he throws his head back quickly, as if annoyed at the impertinence. Tickle him with a straw, and he pushes an orange-yellow horn out from the top of his head, toward the side which was touched; tickle the other side, another appears. Both

issue from the same opening, and the two branch like the two parts of a V. They are scent organs. Immediately a smell is diffused, at first not unfragrant — like some kind of over ripe fruit — but soon sickening; by this odor he probably protects himself from the ichneumon-flies, which would else trouble him; and by it, also, you may know that your specimen is that which we describe.

You may gather a few leaves of the carrot, with the worm, and put them in any safe, airy place where you can watch him day by day; a supply of fresh food will keep him from going away for the present; or you may observe him on the plant where you found him.

In a few days he will quite likely cease to eat. If it were a canary, or a squirrel, which does not dispose of his rations, you might guess that your pet is sick, and so be anxious about him, but you need take little thought for the worm. He becomes restless. He twists quickly from side to side. Presently his skin bursts

just above or behind his head, and he actually begins to creep out of it. There, it is done. Your worm is yonder, in a new velvet jacket, several sizes larger, quite differently and more handsomely marked. It is arranged in cross-way folds, as before. On each fold the sober black is enlivened by several bright orange spots; on the middle of the back, where the white fold lay, is a small white spot, surrounded by six others, while three more are arranged a little lower on either side. The old garment, a shriveled, useless thing, lies there, where he crept out of it, after having fastened its hinder hooks to the leaf on which he rested.

Now he takes his food with renewed relish. He moves more freely, and seems much more at ease in his new and enlarged garment. For several weeks this process goes on. He eats, grows, outgrows his old clothes, and creeps out of them in a new and larger suit,—mamma, did you never wish Bobby could do so too, instead of wearing his trousers out at the knees, and kicking his toes through the copper?—

until after four or five weeks, and about as many changes, he is a full grown worm, or caterpillar. When at rest, he is rather more than an inch and a half long; when creeping about, he stretches more than two inches. The velvet coat is quite gone. In its place he wears a garment softer and smoother than the finest satin, or perhaps more like the delicate kid of which gloves are made, save that the worm's skin is far more delicate. The color is apple-green, paler on the sides, and whitish beneath; the bands are black, dotted with yellow spots, so placed as to form regular lines along his body.

In structure, our caterpillar is an example of all others. His body is made of twelve rings of tolerably firm substance, connected by softer bands, and covered with skin. Thus he has the most perfect freedom of motion. He can stretch or contract himself, can turn or twist in any direction, can roll into a ring, or straighten out stiff, like a twig of the plant on which he feeds, or conform to any unevenness of surface over which he may creep. His head is covered

with a flattened, shelly dish, provided on each side with six minute shining grains, which naturalists say are eyes. They do not say that caterpillars can see; Dr. Morris thinks "it is very doubtful whether they have the faculty of vision." One who watches a worm feeding, moving about, reaching out this way and that, quite ignorant of any danger that threatens, passing at the shortest distance the very thing which it seems to seek, never recognizing any thing except what it touches, and shrinking only when it is touched, can scarcely fail to conclude that, however many eyes the worm may have, it is, in fact, quite blind.

The mouth is armed with a pair of strong jaws, which open and shut, not vertically, like those of a dog, or a man, but sidewise. In the middle of the broad under lip is a small elastic tube, with a minute opening, whence comes the silk which it will some day find useful. In tropical countries the head is often queerly ornamented with spikes, prickles,

horns, and other things; those which we may see rarely have any thing of the kind.

Each of the first three rings of the body has a pair of jointed, tapering legs, covered with scaly or horny mail, and ending with hooks. These are the true legs. The worm has, besides, four to ten — usually eight — false, or pro-legs. These are thick, fleshy, without joints, but can stretch or contract like the body, are furnished at the end with a fringe of small hooks, and can take very different forms, as the animal wishes to cling by them to various surfaces. Caterpillars which have the full number of legs, that is, sixteen, have still four rings unprovided, the fourth and fifth, and the tenth and eleventh. The twelfth, or anal ring, has always a pair; the ninth has usually a pair; the other pro-legs vary with the species.

The motions of a large caterpillar which has the full complement of legs are deliberate and regular. First he stretches out the elastic body, and puts down the six horny

legs together; then the pair of anal legs take themselves up, and replace themselves close behind the pair of the ninth ring, shutting down upon the twig or leaf, as if made of India rubber; then the other pairs of pro-legs lift and move forward, the hindermost rising and falling first, and the others following in their order; mean while, motion seems to begin at the tail, and flow gradually and equably through the entire body, ending by pushing the head on for another stretch. The motion of such as have but one or two pairs of pro-legs is similar in fact, though different in appearance. The hind legs are drawn forward, and set down just behind the true legs, the body being thrown up into a loop; this loop straightened out, carries on the fore legs again. These caterpillars are called loopers, geometers, or measurers, since they seem to measure off the distance of their journeys. Gail Hamilton's gardener says they do so: measuring with his thumb and finger on his coat sleeve.

The looper caterpillars can not shorten or

lengthen their bodies like others, but only bend them. Some are round and stiff, of the same color as the bark on which they live. They grasp the stem or twig with their four pro-legs, while the body stands out stiff and motionless for hours together, and the observer mistakes them for twigs, or leaf-stems.

Each kind of caterpillar feeds by choice only on certain kinds of food, and most will refuse any other variety. They usually prefer leaves; after that, flowers; a few eat the pith of the stalk, and occasional species, the pulp of fruits. Most feed by night, and remain quiet by day, as if torpid; some are so voracious as to eat constantly. A silkworm devours its own weight of mulberry leaves, daily. Reaumur gave to a kind which eats cabbage, bits of cabbage leaf which weighed twice as much as their bodies. The pieces were consumed in less than twenty-four hours, while the worms increased their weight one tenth. What if a man weighing 150 pounds, should eat 300 pounds of food in a day, and gain 15 pounds of flesh!

When a caterpillar wishes food, it creeps out to the edge of a leaf, and twists its body into such a position that this edge passes between its legs, which hook on upon each side. It bites a mouthful from the edge, then another, and another, moving its head in the arc of a circle, and cutting in three or four bites, as a reaper would cut handfuls of grain with his sickle; the head moves back to the edge of the leaf, and begins another sweep; the fore legs move slowly on from time to time, until the caterpillar has stretched its body to its full length. Then the body draws itself back again, the pro-legs keeping their places, and the head cuts in again for a new swath. The pulp of the leaf is eaten down to the ribs, and often ribs and all disappear between the voracious jaws.

But we must return to our caterpillar of the carrot-leaves. When he has finished eating, he becomes uneasy. He no longer rests quietly on his leaf, or he moves only to find fresh pastur-

age; he begins to wander about, and if we do not shut him up, we shall lose him altogether. Presently we find him quiet again in some secluded corner at the top of the case; if he could, he would have found a retreat in a knot-hole, a crevice between boards, or an obscure nook under the fence rail. He now presses the elastic tube of his under lip to the wood; the silk material adheres to it; he draws his head away, and stretches a fibre of silk to another point, where he fastens it by pressing the fresh material against the surface. He crosses and recrosses the threads until he has covered a little space with a hillock of silk, to which he fastens himself firmly by the hooks of his hinder feet. Now clinging by his pro-legs, he bends his head back to about the fifth ring, and fastens a thread to the wood beside him. This thread he carries over his back, and fastens on the opposite side; he lays beside it a second, and a third, and in a little time has spun a stout band or loop of silk, in which he may rest securely.

Some caterpillars, like the dark-colored worms, covered with spines, which infest the hop vines, do not spin the band for the back, but content themselves with the little mass of silk into which the hinder hooks are fastened. These simply hang themselves up, and let their bodies fall into a vertical position. The next business is to throw off, for the last time, its skin. To do this, it constantly bends and straightens its body, until the dried skin splits along the back, and part of the body beneath appears. Next, it draws the fore part of the body out of its covering. Then it lengthens and shortens itself by turns, each time splitting the skin still further, and pushing it, like a stocking, nearer to its tail, where it is soon a mere crumpled packet. Now comes the most difficult part of the whole. Out from its caterpillar skin the creature has come in a smooth, horny armor, laid in rings about its body, while its head, back, and breast, are swathed, like a mummy, in folds which firmly confine every limb. It can only

wriggle, jerking itself from side to side. Its tail is yet in the folds of the caterpillar skin, which is hooked to the silk above. It must draw itself out of this remnant, throw away the cast off garment, and hook itself by its tail to the same place. We see now the utility of the silken band of our worm of the carrot leaves, but the hop worm has no such assistance. It has neither arms or legs — how can it do so much without losing its own hold, and falling to the ground?

The supple, contracting rings which cover its own body are the limbs which it uses. It seizes a portion of the skin between two of these rings, and so holding on, it curves the tail until it draws it entirely out of the sheath which covered it. But its body is shorter than before this change, and it must climb to reach the tuft of silk to which it should hang. It stretches its body as far as it can, and seizes the skin higher up, between two other rings, at the same time letting go below; this process it repeats with different rings in succession, until

finally it reaches the tuft of silk, and fastens to it the hooks in its tail.

It now gives itself a jerk, which sets it to spinning rapidly; it rubs against the skin, and loosens its hold on the silk. If one whirl is not enough, it whirls again, in the opposite direction, and this time will almost surely succeed. Reaumur saw one which, after several efforts to dislodge the old skin, was forced to leave it where it was so firmly fastened.

In about thirty hours after our caterpillar has made himself fast, he has effected this change, and now hangs by his tail, or in his hammock, a pupa, or chrysalis. Here he will remain in unconscious security, during all the quiet days of autumn, and through the bitter blasts and piercing frosts of winter, until the warm breezes of another June awaken his dormant powers to a new life.

Other caterpillars make for themselves cases, or cocoons, spinning them of silk, and often working in other materials. They are for the most part oval, or egg-shaped, sometimes boat-

shaped, and are usually white, yellow, or brown in color. In some, the threads cling very slightly; in others, they are closely gummed together; some are single, others double; some so closely woven as to quite hide the pupa within, others so thin that it may easily be seen; some bind together leaves, within which they hide; some work into the shell bits of earth; while some weave into the fabric the hairs with which their own bodies had been covered.

One variety pulls out its hairs with its teeth, lays them against the web already spun, and then fastens them by spinning more silk over, or, rather, under them — for the outside of the cocoon is spun first, and thickened from within. Another does not pull out its hairs; it cuts them off. Another works its hairs through the meshes of the silken net, and then wriggles about until it rubs them off. Another pulls them out in the first place, then sets them up like the stakes of a palisade, and spins a light

web within, curving them inward so as to form a sort of cradle.

Many caterpillars go into the ground to become chrysalides; there they make round or oblong cocoons. These are always smooth and shining within, and are often fitted with a lining of silk. Reaumur took a cocoon out of the ground, broke it open, and placed it in a glass case containing nothing but sand. In four hours the injury was repaired.

The caterpillar began by coming almost entirely out. It moved its head forwards until it could seize a bit of earth, which it drew into the cocoon; then it came out for another, and so wrought for an hour, gathering material. Then it began to rebuild the broken place. First it spun a band of loose web over a part of the opening; then it placed a few of its grains of earth in the meshes which it had made; it spun more silk, and put more grains in place, binding them together with silken cords. Presently the whole was closed except one small opening, which it filled with crossed

threads, and then finally stopped by pushing among the threads the bit of sand which it had saved for the purpose, and which made all tight.

A caterpillar found on the oak trees cuts off thin strips of bark, which it builds into two compact blades; these it so arranges as to form a hollow cone, or boat-shaped shell, in which it becomes a pupa. It is at once architect, cabinet-maker, and weaver.

In due time — sometimes in a few days, sometimes not until another summer, and in one instance, after as many as seven years — the time comes for the last, and most glorious transformation. The poetical Greeks found in this change a type of the liberation of the soul from its mortal tenement, and its entrance into a higher and happier life; hence they called the Butterfly, Psyche, the soul. This idea is most natural. The worm seems to spin its own shroud, to make its own coffin, often to enter its own grave. Yet within this shroud, this coffin, this grave, it lives, a dor-

business, except flying about, buzzing, and bumping his head. The children call him a Darning-needle, because his body is straight and slender; and as its long and flexible tail twists about more than seems pleasant, they are afraid of it; they believe it can sting, and some call it a Horse-stinger. But the creature has no sting, and can do no harm to man or beast. In the insect world he well deserves his name, Dragon-fly, for he devours multitudes of other insects. When dancing in the sunshine, or in the twilight shadows, he is busy catching gnats, or sweeping up other minute specks which fly in the air. He is not content, even, with such small game, but is the eagle among insects, pouncing upon unwary butterflies, which he drags to some bush to devour at his leisure.

The water is his birth-place. The eggs, like a bunch of grapes, sink to the bottom and hatch out six-footed larvæ, with dusky brown skins. Like many other grubs, when these youngsters grow too large for their clothes, they split them open, throw them away, and

soon appear in a new and larger suit. When full grown, a pair of scales appears on the back, which is a mere suggestion of wings. The head is then armed with a long, jointed trunk, fitted at the end with a pair of strong hooks. While at rest, this trunk lies folded over the face, like a mask; if any prey passes by, the trunk leaps forth, and the hooks grapple the unwary victim.

The Dragon-fly lives as larva and pupa, two years. When ready to come out into the world, it climbs to the top of some water plant, into the sunshine. The eyes show when the change is coming. Instead of dark, dull places where eyes might be, they become clear and bright, and the real eye shines through the mask. If one can be found at this crisis, and fastened where the change can be seen, it will yield much amusement.

First a rent comes in the skin along the back, to the face; here another rent opens crosswise, over the eyes. Now that he has burst his case, he carefully picks out his legs,

and then hangs his head down, motionless, as if dead. He has only hung his moist legs out to dry. Presently he lifts himself again, grasps the case with his feet, and slowly draws out his long tail, and wet, sodden wings. But the tail has not its full length, and the wings are folded. He rests awhile; the tail expands, the wings unfold, and as they harden, glisten like sheets of mica. While in this wet condition, the Dragon-fly is careful not to touch them, even with its body; for a wrong twist now would make a deformity for ever. The change may be passed in a quarter of an hour, or may take several hours, according to the clearness of the air. When the wings are fully spread and hardened, and the bright colors of the mailed body are fully set, he leaves his twig and begins his long journey through the air. Like a newly commissioned Alabama, armed and supplied for a long cruise upon the high seas, he sets forth, a piratical rover, to capture, plunder, and destroy.

While living in the water, this creature has

a way of moving about peculiar to itself. If seen at the bottom of clear water, it seems to move merely because it wills to move, with nothing like walking or swimming — it goes. But if a few grains of sand be near, they seem to will to go backward, at the same time. Put one of the larvæ into water colored with milk or indigo, and then suddenly change him into clear water, and the motion will be explained. He will be seen to spirt a stream of colored fluid into the clear water, and it will be found that he has in his abdomen a set of force pumps. These fill slowly from the fluid in which the larva floats, and then drive out the water backwards, while the same force which ejects the water, pushes the insect forwards. Some English ship-builders propose to drive steamships by this plan, which it may be they borrowed from this very insect. They take water through the bottom of the ship, and then drive it out astern by powerful steam pumps. In this way they expect to force the vessel rapidly through the water.

We nave mentioned the large globes of eyes on either side of the Dragon-fly's head. Under a small lens these eyes seem to be covered with fine net-work. A magnifier of larger power shows that the surface is composed of regular, six-sided faces, so that it resembles a minute crystal honey comb. Farther examination shows that each eye contains more than 12,000 of these lenses, and that what we call the eye is only a bundle of eyes.

Opticians grind a multitude of flat faces on a rounded bit of glass, which they set in a tube. Any thing seen through this tube seems multiplied as many times as there are faces on the glass; the image is very pretty, but very much confused. We need not suppose, however, that the Dragon-fly is puzzled by his compound eye, or that he sees more than one image. Although we have two eyes, we do not see double. The nerves which carry word to the brain that the eyes see something, meet just behind the eyes, and perhaps, for this reason, report but one object. If two eyes thus unite their results, so

that we do not see double, in the same way 25,000 eyes in one head may combine all their results. The fact that we see so many images in the multiplying glass will not trouble us if we remember that our own eye is behind the glass, instead of a bundle of nerves, and there is no way of gathering all the images into one.

There are many species of Dragon-flies, strong of wing, and beautifully colored with bright blue, green, scarlet, glossy black, or transparent white. The body is often of one hue, while the wings are barred or spotted with others. Often the male and female of the same species are variously marked. These bright colors always vanish when the animal dies; in a few days the most brilliant specimens will have faded to a blackish brown. The only way to preserve them is to remove the interio substance, and fill the space with paint of the proper color, and this method does not repay the time and labor spent.

One tribe belonging to this family are called

Scorpion-flies. The rings near the end of the tail are quite slender, and move easily in any direction. The last ring is stout and thick, and bears a strong pair of forceps. When the fly is at rest, the tail is curved over its back like that of a puppy, but when alarmed it flourishes the tail in a very alarming style, the forceps snapping as if something serious would happen if there were a chance.

Some other members of the order *Neuroptera*, or nerve-winged insects, are worthy of notice.

The large, prominent eyes of the Lace-wings, or Golden-eyes, glow with changeful flames of gold and ruby, as if on fire. These insects are small, but their brilliancy and their broad wings make them quite conspicuous. The larva of the lace-wing is very voracious. It is particularly fond of the plant lice, and therefore is quite useful. A single one will clear a densely crowded twig in a short time. It will, however, turn and eat the eggs in which its brothers are ready to hatch, if it can reach them. To prevent this, the instinct of the

mother makes her spin a slender thread, like a bit of bristle, about a third of an inch long; the lower end of this thread she glues fast to a twig, and on the upper end she leaves an egg about the size and shape of the letter o. So she places a dozen in a group, which is easily mistaken for a patch of moss. For a long time these were really supposed to be a variety of moss, nobody suspecting that they were the eggs of an insect. When the first hatches, he falls down upon the twig. He reaches up to breakfast on another egg, but he can not climb the slender waving stalk, so he creeps away, and finds his meal elsewhere.

A somewhat celebrated insect of this family is the Ant-lion. In its perfect state it much resembles the Dragon-fly, but the wings are broader and softer. It is most remarkable when a larva. Then it resembles a flattened maggot, with long legs and large jaws; but the legs are of little use for walking, as it moves mostly by means of its abdomen. It is very slow, and yet very voracious, living on insects

much quicker than itself, which it catches alive. As it can not take them in open chase, it sets an ambush by digging a pit, and lying concealed at the bottom. In this work it begins at the outside. It presses its body down into the sand, and then backs round in a circle, plowing the earth and throwing it outward. So it goes round and round, drawing one furrow after another until it comes to the middle. This plowing is repeated several times, as long as it will turn the earth outward. Then it begins to dig. It goes to the middle, and flings the sand out with its head, and smoothes the sides of the pit, down to the centre, into a regular funnel. If it finds small stones, it jerks them, one by one, over the wall. If too large for that, it takes them on its back and carries them up the slope, and tumbles them over the edge. Sometimes, after toilsomely tugging until a stone is nearly at the top, the pebble topples off and rolls to the bottom again, plowing a furrow as it goes down. The Ant-lion tries again, pushing the load up the same furrow; he

works on until the stone is removed, or until repeated failure satisfies him that he is not equal to the task. Then he leaves the unfinished pit, and digs another.

When finished, the pit is about two inches deep, and three inches in diameter. The Ant-lion lies at the bottom, only his jaws being in sight. When an ant, journeying that way, looks over the edge, the loose sand under its feet begins to slide, and lets it down into the pit. It struggles to regain the top, but that only hastens its fall, and down it goes into the jaws of the hungry monster which waits for it at the bottom. If the ant succeeds in climbing up, and is likely to get out of danger, the Ant-lion shovels sand upon its head, and flings it after the escaping insect. Overwhelmed by this storm the ant is borne to the bottom. When the juices are sucked out of him, the empty skin is tossed over the mound, and the pit is put in order for the next unfortunate.

Thus the Ant-lion lives for about two years. Then it wraps itself in a covering made of sand

glued together, and bound by a kind of silk which it spins. In about three weeks it emerges in its perfect form.

Another of the *Neuroptera* is the May-fly, or Ephemera. The early days of summer bring vast swarms of them, which vanish as suddenly as they come; often a single day is sufficient for the entire round of their perfect life. Hence the name Ephemera—"(lasting) for a day." It is, however, a mistake to suppose that a day is enough for the entire life of the insect from the egg to the grave. On the contrary, two years are passed in the water before the winged form is assumed. Like other creatures that flit a few brief days about watering places—although it does not carry a Saratoga trunk full of finery—it can not do without a change of dress. So, after dancing its set in one costume, it retires to its chamber—a twig—kicks off its garment, and appears in another, bright and new, with larger wings, broader plumes, and longer train.

In both dresses, the May-fly is very eagerly taken by fish, and adroit anglers use them, or

SECTION OF TERMITES' NEST.

imitate them, when they would bring wary old trout from their deepest hiding places. Very much alike — Newport belles, and Newport May-flies!

Termites.

The remarkable insects known as Termites, or White Ants, though commonly called ants, are not classed with that order, but among the *Neuroptera*, on account of the structure of their wings in their perfect stage. Like the ants, the Termites live in societies, which become immensely large. They build for themselves huge cities, great mounds, conical like sugar-loaves, sometimes twenty feet high, and more than a hundred feet in circuit. They make these of clay, and so solid and strong, that the wild cattle climb on them without breaking through. Within they are full of chambers and passages. There are

apartments for the king and queen; nurseries for the young; garrisons of soldiers; dwellings for workmen, and storehouses for food. These edifices are said to surpass the dwellings of ants, bees, and beavers, as much as the architecture of Europeans excels the rude huts of Indians or Bushmen. Some species build in the ground, partly beneath and partly above the surface; others build on branches of trees, and often at a great height.

One of the best known species is the *Termes bellicosus* of Africa. In Senegal, and parts of Central Africa, their numerous clusters of hills resemble the huts in the native villages. The first hill which they make, in beginning a settlement, rises above the ground perhaps a foot. While this grows larger and higher, others spring up at a little distance, and still others, until a circle of small hills surrounds the larger one in the centre. These all keep on growing; presently they join each other, and the middle cone includes or covers up the outer ones. Mean while the inside works

which were first made, are pulled down, and the materials are used for building the outer cones. They have no precise form, the only care being to make them firm and strong. Until they are six or eight feet high they are quite bare, but after that they increase more slowly, and grass often grows upon them. In the hot season, when the grass becomes dry, the whole resembles a large haystack.

The royal apartment, as the most important room of the house, is placed in the centre. It is shaped like half of an egg, cut lengthwise, and is at first about an inch long; it is afterwards enlarged to suit the increased size of the queen, until it is six or eight inches long, or even more. The openings through the walls and roof of this room are large enough to admit the workers which are in attendance, but the royal occupants can never pass out; they are life-long prisoners. A set of chambers about the royal cell contains the soldiers who protect, and the workers who serve the regal prisoners. These rooms are connected

together; they extend a foot or two all round the central apartment. They are surrounded by the nurseries and the storehouses. The latter are built of clay, and filled with gums and similar vegetable substances. The walls and partitions of the nurseries are made of woody fibre, cemented together by the saliva of the insect. When the nest is small, they are near the royal chamber. As the family grows, and the attendants of the queen become more numerous, the nurseries are moved farther away. They are enclosed in clay chambers, like the granaries, and the wooden partitions and linings would seem to prevent too sudden changes of temperature.

A large arched open space, two or three feet high, is left under the central dome, with arched passages on every side, which allow the warm air to circulate freely, and keep the nurseries at a proper degree of heat. The shell which forms the great dome is traversed by large round or oval passages, several inches wide. These ascend spirally, quite to the top,

opening into each other, and into the central dome at proper distances. Other passages of less size connect the larger ones, and others still lead far away under ground. Even if all the Termites within a hundred yards of a house were destroyed, those which live farther away would extend their galleries to the house, eat up the merchandise in it, and destroy every thing. If they can not go under ground in the way they wish, they make pipes along the surface, of the same material as their nest; they often carry these covered ways above ground over the deeper paths, and make frequent communications between them, so that they can escape by one, if they are attacked in the other.

Each village of Termites has a king and queen, an army of soldiers, and a population of laborers. There are about a hundred workers to one soldier; they are about a quarter of an inch long, very busy and very swift. The soldiers are half an inch long, and as large as fifteen of the workers. The winged or perfect

insects are nearly an inch long, and their wings spread above two inches and a half. They are equal in bulk to two soldiers. The young Termites come out of the nest just after the first shower has opened the rainy season. The immense swarms fill the air as with dense white snow flakes. Every living thing seems to be their enemy. The ants fall upon them and eat them; birds come in flocks and pick them up; reptiles and ant-eaters devour them, and the black men gather them as the greatest delicacy. Not one pair in a hundred thousand escapes alive, but that pair will, by and by, produce a hundred thousand a day.

While the winged insects are flying, and being eaten, the workers are running about on the ground searching for them. If a pair is found, they are at once chosen king and queen, and their new subjects proceed to build them a house. They are shut up in a little clay chamber, with only one small entrance, too small to allow them to pass out. Presently the female begins to enlarge in a wonderful manner; and

the house has to be enlarged to correspond. In time, it is thought about two years, she is about three-fourths of an inch wide and three inches long — specimens have been found of twice that length. Her body is now oblong, banded at intervals of half an inch with dark muscles. The transparent skin is of a fine cream color, through which the intestines, and the motion of the fluids, may be clearly seen. When she has reached this size, she produces about eighty thousand eggs a day. The attendant workers carry these away to the nurseries, where they are hatched, and the young provided with every thing needed, until they are old enough to shift for themselves.

When a person enters a piece of ground which is marked by many of the covered ways of these insects, he hears an alarm given by distinct hisses. After that he may search the paths for Termites in vain; they have escaped by the underground lines. The tunnels are made large enough for passing and repassing without trouble. They serve as shelter from

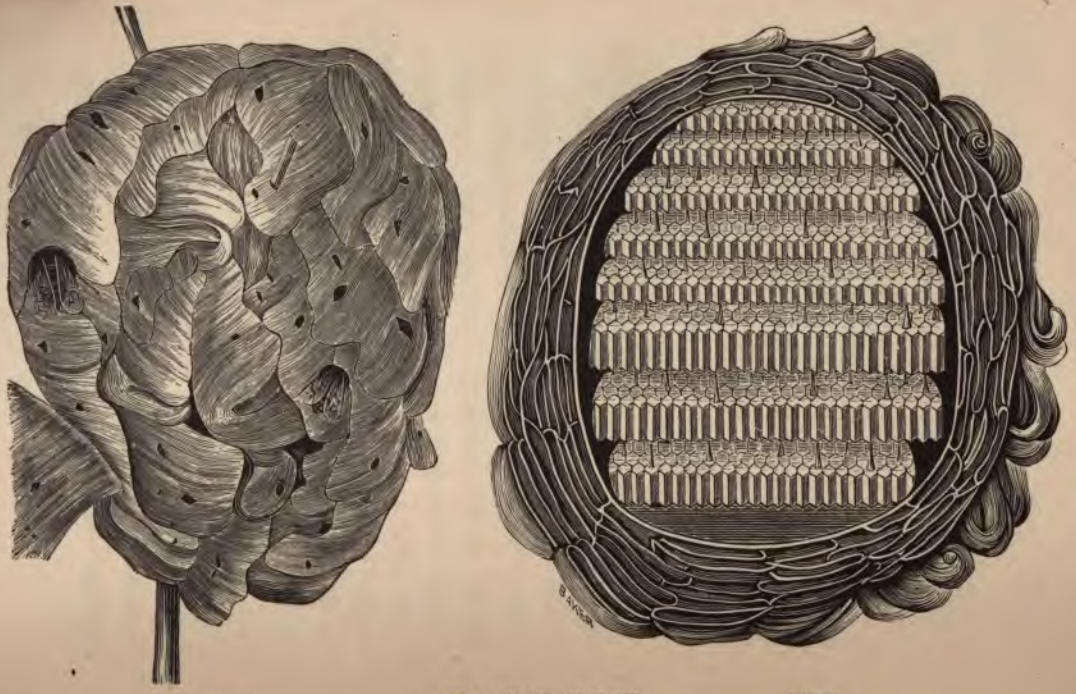
light and air, and particularly from the attacks of other ants. When driven from these defences the ants pounce upon them, and carry them to their own nests to feed their young ones. If the defence is broken, the workers at once set about repairing it, and even if three or four yards is destroyed, the place will be rebuilt before the next morning. If the gallery is often destroyed, it will be given up and another made, unless it leads to some favorite plunder. The main roads are made deep under ground, going under the very foundations of houses and stores, and come up under the floors, or through the posts on which the building rests. While some are boring the posts through and through, and taking out all their fibres, others climb the outside and enter the roof. If they find thatch, which they seem to like very well, they bring up clay and make covered ways in and through the roof as long as it will stand. Thus they carry away, bit by bit, every sill, and post, and beam, floor, ceiling, and partition. The outside seems firm

and sound, but the whole will crumble at a touch. Sometimes they seem to know that a post sustains weight, and then they fill up the cavities which they make with clay, packing it in more solidly than man could. The posts are found filled with material as hard and compact as many kinds of building stone. They will eat the very mat on which a man sleeps. They carry away all the wood of his strong box, leaving a shell as thin as paper. They devour his books, his records, his correspondence. If a piece of furniture be left too long in one place, nothing will remain but the surface. A man may be rich to-day, and poor to-morrow from their ravages.

It is a difficult task to destroy them. Any thing which is washed with corrosive sublimate they respect, but this can not be applied to many things. If the house is broken into, the soldiers come to the breach to defend it. They may be destroyed, but they are not those which do the mischief. The workers are left, and the business of the village

goes on just as before. The only plan which is at all sure is to continue pulling down the nest until the chamber of the queen is found, and she is destroyed. Then the others seem to be bewildered, lose courage, and finally abandon the nest.

About the year 1780, some bales of goods, brought from St. Domingo, were stored in La Rochelle, and in other French seaports, and thus the Termites were introduced. At La Rochelle they took possession of the arsenal, and of the prefect's house, invading rooms, offices, court, and garden. A stake driven, or a plank left, in the garden, was destroyed forthwith. One fine morning the records of the office were found ruined, though not the least trace of damage was seen on the outside. The Termites had mined the wood work, pierced the card-board, and eaten up parchments and papers, but had always scrupulously respected the upper leaf, and the edges of all the leaves. By chance a clerk raised one of the leaves which hid this ruin, and discovered the injury.



OUTSIDE. A WASP'S NEST. INSIDE.

About Wasps.

ARTICULATA — INSECTA.

ORDER — *Hymenoptera*. Membrane-winged.

FAMILY — *Vespidæ*. Wasp-like.

ASPS attract attention, for two reasons. They have sharp, venomous stings, which they are ready to use on small provocation, and so make us afraid of them; and they build for themselves curious homes, which are well worth our study. Those that we are most familiar with, build with mud, or paper.

The paper makers usually choose some sheltered place, under a fence rail, in a bush, in a

hollow tree, or under the projecting eaves of a house. As in the case of the humble bees, the mother of the family, single handed and alone, lays the foundation of the house, and makes preparation for rearing a family. She and a few like herself are the sole survivors of the thronged cities of last year. All the others perished at the coming of the frost which chilled her blood within her and kept her torpid till the warm south winds of spring awoke her from her long sleep.

When quite a little boy, the writer used to go away alone into a closet, to learn his lesson. The blinds at the only window in the room were always closed, giving barely light enough to read, when sitting on a stool beneath it. One spring day a Wasp came between the blind and the glass, and after much buzzing and much walking about, began to build. She first laid down, beneath the under edge of the upper sash, a patch of paper about a third of an inch in diameter; then, standing on this, she raised cup-shaped edges all about her,

increasing outward and downward, like the cup of an acorn, and then drawing together a little, until a little house was made just about the size and shape of a white oak acorn, except that she left a hole in the bottom where she might go in and out.

Then she began again at the top, and laid another cover of paper over the first, just as far away as the length of her legs made it easy for her to work. Now it was clear that she made the first shell as a frame or a scaffold on which she might stand to make the second. She would fly away, and after a few minutes come back, with nothing that could be seen, either in her feet or in her jaws. But she at once set to laying her paper-stuff, which came out of her mouth, upon the edge of the work she had made before. As she laid the material she walked backward, building and walking, until she had laid a patch a little more than an eighth of an inch wide and half or three-quarters of an inch long. When laid, the pulp looked like wet brown

paper, which soon dried to an ashen gray, and still resembled coarse paper. As she laid the material, she occasionally went over it again, putting a little more here and there, in the thin places; generally the work was well done the first time.

So the work went on. The second paper shell was about as large as a pigeon's egg; then a third was made as large as a hen's egg; then another still larger. After a time the wasp seemed to go inside to get her material, and it appeared that she was taking down the first house, and putting the paper upon the outside. If so, she did not bring out pieces and patch them together as a carpenter, saving of work, would do, but she chewed the paper up, and made fresh pulp of it, just as the first was made. Of course the boy did not open the window, for he was too curious to see the work go on, and then he was afraid of the sting. How large the nest grew he never learned, for he soon after left the school, and saw no more of it. The Algebra and Latin which he learned

that term were soon forgotten — he was really too young to study either, then — but he has not forgotten how the Wasp made her nest.

But he now knows pretty nearly what the Wasp did after his oversight of her ceased. She made the nest about as large as a goose egg, hanging with the broad end up, and with a hole as large as one's little finger at the bottom. She took out of the inside all but two or three thicknesses, and then she built paper combs in the vacancy. These paper combs were not made like the combs of the honey bees, standing upon edge, with the cells opening in the sides, but were hung to the top, with the cells opening downward. She made first a stout post or rope of paper, hanging from the centre of the room. To the end of this rope she fastened a floor, which she spread out flat and level until it nearly reached the sides of the room. Underneath this floor, which might quite as well be called a roof, or a ceiling, she made a number of cells, and laid an egg in each. It is not quite settled whether she builds the cells

first, and then lays the roof over them, or whether she makes the roof first, and then places the cells under it; probably the two parts are made nearly at the same time.

As soon as the first eggs are hatched, the cares of the mother Wasp increase, for now she has a hungry family to feed. She must supply their wants, enlarge their cells, make more cells, lay more eggs, make additions to the house, and all together. Was ever poor human mother, left to bring up a family alone, more driven with work? In due time the older grubs are full grown, stop eating, and spin a silken cover over their cells. After a short season, having passed from grubs to pupæ, and then to perfect Wasps, they come forth. They take the heavy work upon themselves, and the toil goes merrily on. Day by day their numbers increase, and soon the mother Wasp has nothing to do but lay eggs in the cells which her children have made.

When the first tier of cells is full, another is made below it. Several pendant cords

similar to the first, are fastened to various points of the tier above. Cells are hung upon them as before, and continually increased in number, until the several parts unite to form a second complete tier. The mouths are placed downwards, and the roof serves as a floor on which the Wasps walk when taking care of the young brood. As among the humble-bees, the first Wasps that come out are workers. The males and females are not seen until autumn. A large nest may contain seven or eight thousand cells, and each cell is occupied, on the average, by three tenants in succession. All the young grubs have to be fed; not with honey, as young bees are fed, but with animal food, usually flies. We can easily see that a good sized Wasp's nest, or vespiary, may be quite a serviceable thing about the house, if, in the end, the Wasps do not become the greater nuisance.

Mr. Wood says he has seen pigs, covered with flies, lying in the warm sunshine, and the Wasps pouncing upon them and carrying them

off. It was a curious sight to watch the total indifference of the pigs, the busy clustering of the flies, which actually blackened the hide in some places, and then to see the Wasp just clear the wall, dart into the dark mass, and retreat again with a fly in its fatal grasp. On the average, one Wasp came every ten seconds, so that the pig-sty must have been a valuable store house for them.

The Wasps are hearty eaters, as well as their grubs. They prey upon other insects, sugar, meat, honey, and fruit. Indeed, they are particularly fond of ripe fruit, and always select the finest specimens, just when they are in their best condition, gnawing holes in them, and spoiling them for the table. Still it may be a question whether the good they do in destroying flies and young caterpillars does not more than pay for all the fruit they eat.

The nests of the paper-making Wasps usually vary from six to twelve inches in diameter. They sometimes become very much larger. A nest is preserved in a museum in Oxford, Eng-

land, which fills a glass case four feet high, by two feet in width. It is turnip shaped, with a large knob at the top by which it hangs. This nest, when found, was about five inches in diameter. It was taken into a house, and hung near a window which gave the builders free passage to the open air. There was no danger in this, as the common Wasp has a much better temper than the hive bee, and is by no means as capricious in the use of his sting. Their captor was disposed to give them every means of living, and supplied them daily with sugar and beer. They consumed daily a pound of sugar and a pint of beer. With plenty to eat they increased rapidly, and the nest grew as fast. In the chamber above, two other nests had been placed, and as those workmen were not fed, when they found that their kinsmen below were faring so sumptuously every day, they deserted their own houses, and joined the colony on the ground floor.

The Chartergus Wasp of Ceylon, another paper maker, uses its nest as a permanent

home, the same family living in it from year to year. This home is enlarged in a way which keeps its shape, and allows farther increase without trouble. The walls are shaped like the sides of a cow bell. The tiers of cells extend from side to side, like the regular floors of a house. When the house is full, another set of cells is built beneath the lowest floor, the wall is lengthened down as far, and a new floor is made to shut up the bottom; so that the new house is the old one with a new story *under*. In fact, probably all the Wasps learned to build by reading Gulliver's Travels. The bells of this Wasp are usually about a foot long; one is described which was six feet long, and of corresponding width.

A South American Wasp has been called *Myrapetra*. It builds a nest of a dark, blackish brown substance, like *papier mâché*. The outside of the nest is thickly studded with projecting spikes or thorns. Their exact use is not known; some have thought that they are to protect the nest from wild beasts;

others suggest that they are meant to conceal the entrances. The tiers of cells are not flat, but shaped like inverted bowls; the dishes grow broader and flatter towards the bottom of the nest.

The other branch of the Wasp family includes the Mud-diggers, or Dirt-daubers. Up in the attic of any old house in our country, east or west, the children will often find, stuck on the walls and rafters, lumps of mud of various sizes and shapes. Some are as thick as one's finger, others as large as one's fist. If one of these shapeless lumps be opened carefully, it will be found to be a mass of cells, each lined with a thin coat of brittle, shelly substance. The builders of these cells are commonly called mud Wasps. When one of these masons has chosen a place, and has begun to work, she brings in her jaws a lump of soft mud. It is not certain where she got it — whether she gathered some dust and moistened it with the liquid of her mouth, or,

as some think, she gathered it where the earth is softened by the wash of the sink. At any rate, she has kneaded it perfectly, and she spreads it as easily as the mason lays his mortar.

Mr. Gosse watched a Dauber, and tells some curious things about her. The first cell was nearly done; the Wasp had just closed the mouth. While gone for more, a pin was thrust through the mud into the cell. When the Wasp came, she laid her mortar over the hole, spreading it very skillfully and evenly. When gone again, the pin made another hole, which she closed up; and so for several times. Finally Madam Wasp got angry, and began to buzz about, trying to catch the house-flies which were near. She seemed quite certain that they had done the mischief, and waited after she had laid more mortar, as if expecting to "catch them at it." Then Mr. Gosse broke off a large piece of the side and bottom, showing the grubs, and the small spiders which she had tucked in for her children's food. This breach

she repaired as quickly as possible, in two or three loads, laying the mud all round the hole, and closing up at the middle.

Presently she began to build another cell, and again she found trouble. A tin-tack was placed in the mud, just where she would lay the next load. When she came back, she seemed quite "bothered;" she ran back and forth over the cells for some time, with the mud in her jaws, at a loss what to do. A hole she could stop up, but here was something in the way. If she should lay the mortar in its place, the tack would be more firmly fixed. If she should place it elsewhere, it would be wasted, or might do harm; if she would try to remove the evil, she must lay down her burden. At length she seized the tin-tack in her jaws and pulled it out, dropping the mud as she did it. Next time she went away, a bit of worsted was pressed into the mud, which made still more serious trouble, as the bit which she could seize would yield without coming away. Still, by taking

hold of the different parts, one after another, and tugging at them a long time, and by walking round and round with it in her mouth, she at length pulled it out.

The Dauber Wasp builds the walls of the cell, and lays an egg. Then she finds some spiders of a beautiful green species, and puts them in, bringing them very carefully in her jaws and feet. These she walls up with the egg, and the grub, when hatched, eats up the soft parts of the abdomen.

When autumn comes, the Wasps seek for hiding places in the crevices of houses, where they may pass the torpid months. Sometimes they crawl away where their presence is not desired — into clothing, and between sheets. An acquaintance had a beautiful black pointer dog, named Don. Don had a great dislike for black Wasps, and when they began to creep about, looking for their hiding places, he killed very many of them. He would draw back his lips from his teeth, so that they might not sting him, and then snap them in his teeth, throwing

them quickly on the floor. If the Wasp writhed or crawled, another and another snap was sure to follow, until the crushed insect showed no more signs of life.

A large and fierce variety of Wasps is called the Hornet. Its sting is very venomous, and its temper none of the best. It will follow a person, single handed, with great perseverance, when its wrath has been provoked.

Another very tetchy and hot tempered little thing, is a smaller variety, known to school boys as Yellow Wasps. They are usually quiet enough when undisturbed, but woe to the foolish boy who throws a stone, or thrusts a stick into their paper house. The angry swarm issues forth; they buzz about the ruined nest for a moment, and then, discovering the author of the mischief, they fly in solid column to avenge the wrong. If the unlucky urchin has not speedily taken himself far away, he will have good cause to repent an injury to a quiet and unoffending, if not inoffensive, community. These fellows do not give any warning, like the

honey bee, but true as an arrow to the mark, they go straight at you, and ear, eye, cheek, lip —the part hit, suffers. The best course for the boy is to pocket the affront, and put some aqua ammonia, also called spirits of hartshorn, on the wound. Better still, let the Wasps alone in the outset. If it is necessary to remove them, put a wisp of straw on the end of a pole, and burn them out at nightfall. If it is desired to remove a nest with the inhabitants, for study, the Wasps may be quieted with chloroform, applied at the bottom of the nest, by a bunch of cotton.

THE MIGRATORY LOCUST.

GRASSHOPPER LAYING EGGS.

About Locusts.

ARTICULATA — INSECTA.

ORDER — *Orthoptera*. Straight-winged.

FAMILY — *Locustidæ*. Locust-like.

LOCUSTS and Grasshoppers belong to the same order, and few but naturalists know the differences between them, or are able to distinguish the species of either. They have the same general shape — a long body, stiff, folded, fan-like wings, under straight, hard wing-covers, a head not unlike that of a horse, and long legs, the last pair having long and very strong thighs, with which they leap very far. The Arabs say that the Locust was

made of scraps of all animals. That it has the head of the horse, the horns of the stag, the eye of the elephant, the neck of the ox, the breast of the lion, the body of the scorpion, the hip of the camel, the legs of the stork, the wings of the eagle, and the tail of the dragon. The wings of some are spotted, and the spots have been supposed to foretell future events.

Locusts have been counted among the most fearful plagues which have ever punished a nation. In Eastern lands they have appeared in astonishing numbers; their swarms have darkened the sun; they have eaten every green thing, leaving the land behind them black as if burned with fire. They are not even content with that which is green, but devour every thing which can be devoured — linen, woolen, silk, leather, the very varnish of the furniture.

In 1748 the locusts appeared early in June in Hungary, on the Danube. In July they were terribly destructive throughout Poland, and at the middle of August they appeared in clouds in London. In one night they ate the

grass and the foliage of trees about Vienna, making the forests bare as brooms. In Poland they covered the country for miles, and were heaped up a foot thick; when they alighted they covered the ground like falling snow. At Warsaw soldiers were sent out against them with cannon. The firing of great guns scattered them and drove them away. In Italy the government offered rewards for them, and 12,000 sackfuls were gathered, cast into pits, and covered with quicklime.

The prophet Joel gives a description of their coming, both sublime and accurate: "A day of darkness and of gloominess, a day of clouds and of thick darkness, as the morning opened on the mountains; a great people and a strong. A fire devoureth before them, and behind them a flame burneth. The land is as a garden of Eden before them, and behind them a desolate wilderness; yea, and nothing shall escape them. The appearance of them is as the appearance of horses, and as horsemen shall they run. Like the noise of chariots on the tops of moun-

tains so shall they leap; like the noise of a flame of fire that devoureth the stubble, as a strong people set in battle array. They shall run like mighty men; they shall climb the wall like men of war. And they shall march every one his ways, and they shall not break his ranks; neither shall one thrust another. They shall walk every one in his path, and when they fall upon the sword they shall not be wounded. They shall run to and fro in the city. They shall run upon the wall. They shall climb up upon the houses. They shall enter in at the windows like a thief. The earth shall quake before them; the heaven shall tremble; the sun and moon shall be dark, and the stars shall withdraw their shining."

The prophet also mentions the usual way in which the locusts are destroyed: "I will remove far off from you the northern army, and will drive him into a land barren and desolate, with his face toward the east sea, and his hinder part towards the utmost sea, and his stink shall come up because he hath done great

things." This prophecy may refer to the coming of an army of human beings, but the description literally applies to the march of these insects as described by historians. Mr. Barron says that in 1784, and in 1797, two thousand miles in South Africa were covered with Locusts, which, being borne into the sea by a northwest wind, formed, for fifty miles along the shore, a bank three or four feet high; and when the wind was in the opposite point, the horrible odor from them was perceptible a hundred and fifty miles away.

Most scourges bring in their train benefits which fully repay, if they do not many fold surpass, the injury inflicted. The prairies rejoice in a greener verdure after the fire has consumed the withered grass. So a land which has been choked with rank shrubs and withered bitter grasses, after it has been swept by the Locusts, soon wears a more beautiful dress, with new herbs, superb lilies, fresh annual grasses, and young and juicy shrubs, which afford sweet pasture for wild cattle and game.

Locusts are eaten by all sorts of quadrupeds, by many birds, large and small, and even by man. In the countries which they ravage, the people have nothing else left to eat, and learning from necessity, they continue to eat Locusts from choice. The Arabs boil them and dry them in the sun. Others soak them in oil. In other places they are gathered in heaps and salted. The wings are taken off, and the bodies eaten as meat, or they are dried, ground, and made into bread. They have even been exported, and armies have been relieved by them. The African Bushman delights in a swarm of Locusts, as his choicest game, furnishing plenty of food without having to work for it. He makes large fires, and the Locusts, flying through the flame, have their wings scorched, fall into the fire, are roasted and eaten. Those that remain are ground between stones, and kept for another meal. Europeans dislike them, but the fault is probably in the cooking; Dr. Livingstone thinks them very good eating when well prepared.

Honey is eaten with them, when it can be had, as it assists digestion.

Does this remind us of John the Baptist, whose "meat was locusts and wild honey." It has been questioned whether the quails which the strong east wind blew together for the Israelites in the desert, were not truly Locusts; there is doubt whether the word translated quail had ever that meaning. The Jews ate Locusts, and distinguished between such as were clean or unclean.

The young Locusts do not pass through the several changes which most insects undergo. The bee, for example, is first a grub, then a chrysalis, then a perfect, winged bee. The Locust comes from the egg a Locust, but wants wings, which come gradually. The eggs are laid in the ground. The female pierces the ground with a long, two bladed, hollow instrument. When it is forced into the soil, the blades open a little, and press the earth aside, while a dozen eggs are passed into the cavity then formed. The contrivance is not unlike a

corn-planter, which makes a hole, drops the corn, and covers it, all at once. The Locust goes about thus, planting her eggs, until she has deposited several hundred. They remain during the winter, and until the warm sun next summer hatches them, bringing out little creatures as large as gnats. These stay a while in the nest, and in the ground near by, and then come forth, hopping about without wings. As they grow they shed their skins, each time appearing in a new, larger, and more perfect dress. By the third or fourth change, wings begin to appear, and by the sixth they are full fledged. The common Grasshoppers make their entire growth in one season, but the terrible migratory Locust, which has been mentioned above, is said to live in the ground two years, and come forth in the third.

It is often a matter of surprise that insects like the Locusts, the chinch-bugs, and others, should not be observed for many years, and then should appear in swarms of such immense numbers, and do such terrible mischief. Many

attempt to account for this by supposing that the ground has some hidden power of spontaneous production, which is thus fitfully exerted It is probably the fact that these insects never entirely disappear; that no season passes without producing enough to keep up the succession. They are exceedingly productive, so that a few may be the parents of a multitude. But the dangers which surround the eggs and the young, eaten as they are by every kind of bird and insect, and destroyed by myriads by unseasonable cold and rain, sweep them away, and leave only a remnant for seed. If only one in a thousand escapes, that one will reproduce a thousand. Thus if two favorable seasons follow in succession, the scourge appears, and the crops suffer.

In the south of Europe rewards are regularly paid for the collection of Locusts and of Locusts' eggs. The city of Marseilles expended 20,000 francs for that purpose, in one year. A franc is paid for about two pounds and a quarter of eggs. In Italy large quantities have been

gathered and thrown into the streams. There is a slight difference in the piercer of the Locust and of the Grasshopper, but the method of placing the eggs in the ground is essentially the same.

One of the most noted among the Grasshoppers is the Katy-did. This insect is of a pale green color; its head seems to have been squarely chopped off; its wing-covers are rounded, and enclose the wings and body like the sides of a pea-pod. It lives in the branches of trees, and does not lay its eggs in the ground, but deposits them upon the twigs and branches in regular rows. The song of the Katy-did is one of the cheerful sounds of autumn, save that from constant repetition it becomes tiresome. It is not truly a song, for it is not made by the mouth.

"The musical organs of the male consist of a pair of taborets. They are formed by a thin, transparent membrane stretched in a strong, half-oval frame in the triangular overlapping part of each wing cover. During the day they

are silent, but at night the males begin the joyous call by which they enliven their silent mates. This proceeds from the rubbing of the taboret frames against each other when the wing covers are opened and shut; and the notes are repeated for hours together. The sound may be heard in the stillness of the night to the distance of a quarter of a mile. At the approach of twilight the Katy-did mounts to the upper branches of the tree in which he lives, and, as soon as the evening shades prevail, begins his noisy babble, while rival notes issue from the neighboring trees, and the groves resound with the calls 'Katy-did-she-did, she-didn't, she-did,' the livelong night."

He put his acorn helmet on;
It was plumed of the silk of the thistle-down
The corslet plate that guarded his breast,
Was once the wild bee's golden vest;
His cloak, of a thousand mingled dyes,
Was formed of the wings of butterflies;
His shield was the shell of a lady-bug queen,
Studs of gold on a ground of green;
And the quivering lance which he brandished
Was the sting of a wasp he had slain in fight
Swift he bestrode his fire-fly steed;
He bared his blade of the bent-grass blue;
He drove his spurs of the cockle seed,
And away like a glance of thought he flew

The moth-fly, as he shot in air,
Crept under the leaf, and hid her there;
The katy-did forgot its lay;
The prowling gnat fled fast away;
The fell mosquito checked his drone,
And folded his wings till the fay was gone;
And the wily beetle dropped his head,
And fell on the ground as if he were dead.

They watched till they saw him mount the ro
That canopies the world around;
Then glad they left their covert lair,
And freaked about in the midnight air.

The Culprit

TRANSFORMATIONS OF THE MOSQUITO.

About Mosquitoes.

ARTICULATA — INSECTA.

ORDER — *Diptera.* Two-winged.

FAMILY — *Culicidæ.* *Culex*, A gnat.

THE Mosquito is a nuisance. He sings and then he bites; and his singing is usually notice that he intends to bite. He comes in the night, when the faint and sultry air persuades the sleeper to throw off the protecting cover, and sleep flies before him. If one seeks a shelter from the glaring sun, under the shade by the brook-side, myriads of these gauze-winged musicians warn him away from their realm. The wild forest is full of them.

heavy timber, from June to September, is utterly uninhabitable, unless constant war is made against the Mosquitoes. Every bit of standing water, and every purling rill, teems with them. The trees and bushes every where shelter them. Shake a bough, and a swarm rises from it; land from a boat, and a cloud tender a too cordial reception. They gather like hungry politicians about the dispenser of official favors.

Nothing but thick leather and woolen will protect your ancles or your wrists. You can save your face in only one way. Wear a soft hat that you can sleep in; get a yard of black lace, sew the ends together, and draw round the crown of your hat one end of the bag which you make, while you gather the other end under your chin. The brim of the hat will keep the veil from the face, and the disappointed Mosquitoes will rave in vain against the outside. In a few moments one becomes so accustomed to the veil that it does not interfere with sight, although it is in the way in eating and drinking. It is no exaggeration to say, that in the dense forest, in June,

the Mosquitoes have gathered upon the back of a man sitting down to rest, so thickly as to hide the color of his coat, whether light or dark, with the brown of their wings.

The Rev. Walter Colton tells how the miners in California made culprits disclose the truth by means of Mosquitoes. A rogue had stolen a bag of gold and hid it. Neither persuasions or threats could make him tell where it was concealed. He was sentenced to receive a hundred lashes, but was told that he would be let off with thirty, if he would tell what he had done with the gold. He refused. The thirty lashes were laid on, but he was as stubborn as a mule. He was then stripped, and tied to a tree. The Mosquitoes, with their sharp bills, went at him, and in less than three hours he was covered with blood. Writhing and trembling from head to foot, he exclaimed, "Untie me, untie me, and I will tell where it is!" "Tell first," was the reply. So he told where it might be found. Then some of the party, with wisps, kept off the hungry Mosquitoes, while others

went where the culprit directed, and found the bag of gold. He was then untied, washed with cold water, and helped to his clothes, while he muttered, as if talking to himself, "I couldn't stand that, anyhow."

There is no doubt that a man would perish in a short time, from loss of blood, and from the fever caused by the poison of their bites, if exposed, as this man was, with no means of defence.

The largest kind of Mosquito about the Mississippi river is called the "Gallinipper." The boatmen say that it is as large as a goose, and that it carries a brickbat under its wing, on which to sharpen its bill.

Cattle are not troubled by Mosquitoes, but horses suffer terribly. The lumbermen drive them away from their camps by making low fires of chips and damp grass. In the coolness of evening, the smoke from these "smudge" fires hangs heavily over the ground, and affords considerable protection, which even animals seek.

On a still night such a camp is very picturesque. The low log hut by the river; the tall, sombre pines, towering above dense masses of maples, and ragged outlines of oaks; the straggling fires, that thrust out tongues of fitful flame, and reek with thick smoke, which spreads upon the ground, or lazily rolls over the roof; the long, level lines of blue haze which the smoke finally draws against the foliage of the trees; the solemn stillness resting over all, broken only by the hoot of the owl, the wail of the whip-poor-will, or the tinkle of the rippling stream, while the bright eyed climbing stars replace the waning twilight; compose a scene too lovely to be spoiled by millions of myriads of swarming, howling, raving, hungry Mosquitoes.

The Mosquito is an insect of the water. Early on a summer morning, even before sunrise, the mother may be found laying her eggs. They must be placed where there is warmth enough to hatch them, and where the young creatures which pop out may go at once in

the water. So the careful insect, l
mother of Moses, puts her children int
ark, which she leaves on the surface of t
The ark she makes of the eggs the
She rests on a bit of grass, or a leaf, at
of the water, holding to it by the first
ond pair of legs. The third pair she
behind her like the letter X. The firs
caught and held between the legs.
another and another are fastened to
by the gum which covers them, until fi
twenty have been set up side by side,
might set up a number of ears of corn,
the seeds in the head of a sunflower.

When the mass becomes too heavy
to support, she lowers it upon the wa
still holds it by putting her feet on eith
until two hundred and fifty or three
eggs have been laid. Those at the s
higher than those in the middle, while
the ends are raised somewhat more. T
whole mass is shaped much like a
These tiny black boats, about as large a

of wheat, may be found floating upon the top of any tub, or barrel of water, which has stood for some days. Nothing can harm them, if some other creature does not eat them up. The storm may dash them against the shore, but they are too light to break; a torrent of water may be poured upon them, and they come out of the bubbling foam as buoyant as air, and as dry as a duck; the water may freeze solid, but their life is not destroyed.

In a few days — three are usually enough, if warm — the eggs hatch, and each sends a wriggler down into the water, through a hole in the bottom. The little fellow swims about, and presently hangs himself by his tail to the surface. If disturbed, he goes down out of the way, but soon comes back, and rests, as before, with the tip of his tail out of water. He does this, just as other swimmers do, because he would keep his nose above water. The odd thing about it is, that his nose, or, at least, the tube which he breathes through, is not on his face, but at the tip of his tail. It ends in a few

hairs, which spread in a star-form, and are oiled, to repel the water. Thus the tail is both nose to breathe through, and buoy to keep itself at the top of the water. He lives upon the impurities in the water, and so serves a very useful purpose in the world.

By and by, he changes into a pupa, and then he turns himself over, end for end. He did breathe through his tail; now he breathes through his ears, or a pair of tubes which look like ears, and are thrust up, just a little, out of the water. His tail is now like the tail of a fish, and by it he can move himself through the water as he pleases. He remains thus about fifteen days, and then takes a new form, exchanging his home in the water for a life in the air.

When the warm sun shines on the water, the change comes. The pupa rises to the surface, and thrusts out his head and shoulders. The cover bursts, and the plumed head appears, followed by the shoulders, and the filmy wings. Now is the time of danger. If an unlucky puff

of air sweep the water, over goes our sailor, his wings are wet, and his voyage lost, just as he is ready to come into port. His old garment lies upon the water. It is his life-boat. His body is the mast, and his drying wings are the sails. Now his slender legs are dry, and with them he feels for the surface of the pool. He lifts himself free from his cast-off coat, rests an instant on the water, and then leaps into the air, a singing, stinging Mosquito.

But all the Mosquitoes do not sting. The males wear a pair of plumes upon their heads, and spend their days in a ceaseless dance in the sunbeams. Those that bite are the females. One gently drops on your neck or hand, with footstep so light that you feel it not; she looks about for a moment, hesitating as to where she will begin to bore. Now she has found the place, and her needle tongue goes down into the skin. Now you feel the prick, and now you may see her chest heave as she pumps up the red fluid. No speculator, boring for oil, ever felt happier over a flowing well, than our

borer over the flowing fountain which she has tapped. Now her abdomen expands, more and more, until it seems that she will burst. At last she has enough — too much, in fact, for her greed will cost her life. She draws up the rod, and heavily flies away. Her light wings can scarcely bear the increased burden. She will die of surfeit.

TO A MOSQUITO.

Fair insect! that, with thread-like legs spread out,
And blood-extracting bill and filmy wing,
Dost murmur, as thou slowly sail'st about,
In pitiless ears full many a plaintive thing,
And tell how little our large veins should bleed,
Would we but yield them to thy bitter need.

Unwillingly, I own, and, what is worse,
Full angrily men hearken to thy plaint;
Thou gettest many a brush and many a curse,
For saying thou art gaunt, and starved, and faint:
Even the old beggar, while he asks for food,
Would kill thee, helpless stranger, if he could.

Beneath the rushes was thy cradle swung,
And when, at length, thy gauzy wings grew strong,
Abroad to gentle airs their folds were flung,
Rose in the sky and bore thee soft along;
The south wind breathed to waft thee on thy way,
And danced and shone beneath the billowy bay.

Calm rose the city spires, and thence
Came the deep murmur of its throng of men,
And as its grateful odors met thy sense,
They seemed the perfume of thy native fen.
Fair lay its crowded streets, and at the sight
Thy tiny song grew shriller with delight

At length thy pinions fluttered in Broadway—
Ah, there were fairy steps, and white necks kissed
By wanton airs, and eyes whose killing ray
Shone through the snowy veils, like stars thro' mist;
And fresh as morn, on many a cheek and chin,
Bloom'd the bright blood thro' the transparent skin.

Sure these were sights to touch an anchorite!
What! do I hear thy slender voice complain?
Thou wailest, when I talk of Beauty's light,
As if it brought the memory of pain.
Thou art a wayward being — well — come near,
And pour thy tale of sorrow in mine ear.

What says't thou—slanderer! rouge makes thee sick?
And China bloom, at best, is sorry food?
And Rowland's Kalydor, if laid on thick,
Poisons the thirsty wretch who bores for blood?
Go! 'twas a just reward that met thy crime—
But shun the sacrilege another time.

That bloom was made to look at, not to touch;
To worship, not approach, that radiant white;
And well might sudden vengeance light on such
As dared, like thee, most impiously, to bite.
Thou should'st have gazed at distance, and admired,
Murmured thy adoration, and retired.

Bryant.

About Beetles.

ARTICULATA.— INSECTA.

ORDER — *Coleoptera.* Sheath-winged.

KNIGHTLY armor of proof protects the Beetle. First, there is the strong helmet, with shut visor, and crest of varied device. Then comes the solid cuirass, which protects the body, and below that the full-orbed, or oval shield, which covers the abdomen, and the upper joints of the legs. He carries neither sword nor lance, mace nor battle axe, but from the joints of his visor project two ponderous jaws, which grip like a vice. He is horse and horseman in one. His

thick shield parts in the middle, and wh
two leaves swing apart, they disclose a
light, gauzy wings, which, with a great
fussy buzzing, lift him from the grou
carry him away, when he,

"Drowsy beetle, wheels his droning flight."

The plates of his coat of mail fit eac
very exactly. The helmet makes the
joint with the corselet, and the corsel
the shield. The wearer can move eve
with perfect freedom, and yet each j
closed against prick of arrow or thrust o
Yet the Beetle is not the swift horse
to-day, but resembles more the heavy
arms of three hundred years ago. W
was pushed off his horse in sham or rea
and lay sprawling on his back, boxed u
heavy plate armor, he needed a stout es
set him on his pins again. Just so, if
ming beetle be knocked on the floor; i
him a long while to overcome his astoni

and make ready again for a tilt at the lamp, or at your face.

Our knight has little of the swift dash of the wasp, who pricks with his sharp lance, and then rings his shrill defiance. He has none of the stealthy adroitness of the spider, who lassos his victim, like a Mexican, and then stabs him in the back, as coolly as an Italian bravo. Indeed, he does very little at offensive warfare. If you are in his way, he gives you a sharp pinch, or whacks you in the face, but that is all. His heavy mail serves mostly to ward off the assaults of others.

The style and the ornaments of his armor are very various, and often are very beautiful. Sometimes the whole suit is plain black, or dark brown. Sometimes it gleams with brilliant hues of green, crimson, purple, and gold, or blazes with precious gems, set in polished metal. In any case, he keeps his armor scrupulously clean, no matter how filthy the work which he is busied about.

The order contains over one hundred thou-

earth, it will often be found, on the next morning, half sunk in the soil. Take up the bird, and you will find under it one or two beetles, sometimes entirely black, sometimes barred with orange. During the day the insects will usually be quiet, but at nightfall they will begin work again. The work of burying is done almost entirely by the male Beetle, the female either hiding in the dead body, or sitting quietly on it, and being buried with it. The male begins by turning a furrow all round the bird, about half an inch away. His head is held sloping outwards, and like a strong plow, turns the earth aside. When the first furrow is made, a second is turned within it, the dirt being thrown into the first. Then a third is made, and this is quite under the bird, so that the Beetle is out of sight. The work may be traced by the heaving of the earth, which now makes a wall, and as it grows higher, the bird sinks. After hard work for about three hours, the Beetle comes forth, and crawls upon the body, to see how he succeeds. He rests half

an hour, goes down again, dives into the grave, and pulls the bird down by the feathers. He works two or three hours more, plowing and pulling; then comes up, takes another survey, and drops down, as if suddenly fallen asleep. When he is rested, he pulls the bird about, this way and that, tramples it down, and settles it to his mind. Then he goes behind the rampart of earth, and plows it back into the grave, with great skill and strength. He bends his head down first, and then turns up his nose with a jerk which throws the earth forward. When the grave is filled, and carefully examined, no feather being left in sight, he digs a hole in the loose earth, and having already buried the bird and the female, next buries himself. The female lays her eggs, the pair take a full meal of the carcass, then dig their way out, and fly away.

If the creature is no bigger than a mouse, a single day will be long enough to bury it in. One buried a mole, forty times as large as itself, in two days. A French naturalist placed two

pairs of these Beetles under a glass case, and furnished them with dead bodies. In fifty days they had buried four frogs, three small birds, two fishes, one mole, two grasshoppers, and three bits of flesh. All this work is done to secure a nest and food for the young, and to protect it from other creatures, as the fox, or the raven, which might devour flesh and young Beetles together.

The work is done very much as men sink wells in sandy ground. They sometimes lay down on the earth a ring of plank, as large as the well is to be. Then they build a circular wall of brick and mortar upon the ring. The sand is taken out from under the plank, and the whole wall sinks slowly down. So the well is dug as deep as may be necessary, while the wall is built up at the top, as fast as it settles into the ground.

Another burying Beetle is the Dor Beetle, called, in this country, Tumble-bug. This is akin to the sacred beetle of ancient Egypt, or the Scarabæus. Its image was engraved on

rings, which soldiers wore to show that they were warriors. On temples or columns it was a symbol of Divine wisdom, which regulates the universe, teaches mankind, and is self-existent. In its singular habit of rolling about pellets of dung the Egyptian astrologers thought it represented the revolutions of the sun, moon, and stars.

When this insect finds a patch of cow-dung, she sets herself at work. First she digs a deep hole, smooth and round. Then she cuts off a portion of the patch, lays an egg in it, and rolls it about into a rude ball. Now she rests her fore feet upon the ground, and with her hind feet rolls the ball hither and thither, until the outside has gathered in the dust and sand, a thin, hard crust or shell. Then, always pushing backwards, she rolls it to the hole, tumbles it in, and covers it with earth. The egg is soon hatched, the grub feeds on the substance which surrounds it, changes to a chrysalis, and remains in the shell, which still serves to protect it, until it is ready to come forth, a perfect Beetle,

qualified to roll pills on its own account. The smooth surface of this beetle, which gleams like polished steel, retains no trace of its work. Not a spot or a stain defiles it, nor does any odor betray its occupation.

Some of these rolled cocoons are very large. A specimen in the British Museum, made by the *Goliath*, is as large as a swan's egg. The walls are quite thin, and are strengthened by a belt about the middle. The insect which grew in it is still inside, and may be seen through an opening at one end. Its plates of mail are rich, velvety chocolate, edged with broad bands of white. This species, the largest now known, has a body about four inches long and two inches broad; when walking, it covers a space of nearly six inches.

An interesting family of Beetles includes the Dors, May-bugs, Cock-chafers, and Rose-bugs. They are very common and well known, both as Beetles and as grubs. The perfect insect does not live more than a week, and the species is not seen more than four or six weeks in a

season. The females burrow in
about six inches, to lay their eggs -
as many as two hundred. In abo
days the eggs are hatched, and pr
grubs, each having six legs near th
a pair of strong jaws. Their skin
and partly transparent. When thr
the plow or spade, they are found
ring, or a horse-shoe. A full gro
nearly as large as one's little finger
fat morsel, very eagerly swallowed b
chickens.

They do much mischief, eating
roots of grass, grain, herbs, and tr
very numerous, they have so cut o
of grass, that the turf could be r
many places like a carpet. As wi
they descend below the reach of f
torpid until spring; then they c
skins, and go back to the surface.
of the third summer — some say
they go down about two feet, and e
moving from side to side, forms a

space, about the size of a pigeon's egg. Here it casts its skin, and becomes a pupa, whose clear salmon-colored skin shows under it the head, eyes, jaws, wings, legs — all the parts of the perfect beetle. In February this skin bursts, and the insect is ready to dig its way out when the first warm week of May has clothed the trees with leaves. In digging out decayed stumps of trees, fine opportunities may be had for observing these grubs in every stage of their lives.

The winged beetles do as much harm by eating the leaves of trees, as the grubs did by devouring the roots. During the day they remain on the branches, hidden under the leaves. At nightfall they begin to buzz about, humming among the trees until midnight. They often come into houses, attracted, and blinded, by the light. They dart about with very uncertain aim, putting out candles, whacking unlucky people in the face, and banging against trees and walls so hard as to throw themselves stunned upon the ground. Hence come

the sayings "blind as a beetle," and "beetle-headed." When very plenty, the attempt has been made to check their ravages by shaking them from the trees upon cloths spread underneath. They are then thrown into boiling water, and fed to fowls or hogs. In this way they have been gathered by pailfuls, and in a few days no more could be found. Many years ago these beetles were so plenty in Norwich, England, that a farmer and his men claimed to have gathered eighty bushels of them; and they and their grubs had done so much harm, that the city gave the farmer twenty-five pounds for relief.

The Rose-chafer, like the May-bug, does much harm in gardens and nurseries. It is about one third of an inch long, covered with yellowish down. The slender, red legs end in long feet. They come forth about the second week in June, and remain about a month. The eggs are hatched in the ground, and the grubs feed upon roots until autumn, when they descend below the frost. In the spring they

come up again. In May they pass the first change, and in June come forth fledged Rose-bugs. They can be destroyed only by crushing, burning, or throwing into scalding water. They eat the leaves not only of rose bushes, but also of fruit trees.

Certain Beetles called Stag Beetles, and Horn-bugs, from their jaws, which resemble the horns of oxen or deer, belong to the family *Lucanidæ*. They fly by night, and often the lights attract them into houses, to the great alarm of the people within; but they are quite harmless, and will not even pinch, unless provoked. Their grubs resemble those of the Scarabs, and live in the trunks and roots of trees. When full grown, they make cocoons of bits of wood and bark, glued together, and wait the changes which make Horn-bugs of them.

The grubs of the *Buprestidæ* are the borers so destructive to fruit and forest trees. They are long, narrow, and flat, with large, hard heads and jaws. They have no legs, but

move by twisting from side to side, and by pulling with their jaws. They may be destroyed by thrusting a wire after them, into the hole which they are making — if it can be found. The crushed grub will come out on the point of the wire, to prove the success of the experiment. Possibly, however, woodpeckers would be more expert at this kind of thing than men.

Another family that are great pests are the *Curculios*. These spoil the fruit, attacking plums, apricots, and cherries, and not sparing apples, pears, and peaches. As soon as the fruit is set in the spring, these little insects begin their work, and they keep at work, until July or August. The Beetle cuts with its snout a little curve in the skin of the plum, then turns round and lays an egg in the wound. A maggot hatches, which eats its way into the fruit, even to the stone; this causes the plum to become diseased, and to fall off before it is ripe. When the plum is partly grown, the curved scar may be easily found. All such,

with all that fall upon the ground, should be gathered and destroyed, to prevent the maggots from going into the ground to pass the changes, and coming out afterwards to keep up the evil.

Others of this family attack the pines. Wilson says: "Would it be believed that the larvæ of a fly no bigger than a grain of rice, should silently, and in one season, destroy some thousands of acres of pine trees, many of them two and three feet in diameter, and a hundred and fifty feet high! In some places the whole woods, as far as you can see around you, are dead, stripped of their bark, their wintry arms and bare trunks bleaching in the sun, and tumbling in ruins before every blast." Besides boring into the trunks, these insects often destroy the top shoot of the tree, on which its straight and lofty growth depends. Mr. Wilson suggests that until farmers can devise some better plan of killing these pests, they had better thank and protect the woodpecker.

Another rascal of this tribe is the wheat-

weevil. Several insects are known by this name, but the one meant is a slender Beetle, about one eighth of an inch long, and of a pitchy-red color. It lays eggs upon the harvested wheat, and the grubs burrow into the grain, each one taking possession of a single kernel. The worm eats the substance, but leaves the shell, so that the only evidence of harm is the lightness of the grain. They may be destroyed by drying the wheat in kilns.

After the peas have blossomed, and while they are just beginning to swell in the tender pods, the Pea-beetles gather by night, or in cloudy weather, and lay their tiny eggs in minute holes which they pierce in the surface of the pods. The maggots, as soon as hatched, bury themselves in the peas, and the small holes are soon closed. Often every pea in a pod contains a grub. They remain in the peas after they ripen, and come out in the spring, perfect bugs, ready to carry on the work. Those who plant "buggy" peas will find the bugs are quite as sure to come up, and bear

fruit, as the peas. The crow-blackbird is fond of the bugs, and the Baltimore oriole, or hang-bird, splits open the pods to get the grubs in the green peas. Don't disturb him, for be sure if he wants the peas, you don't.

Another nuisance in the garden is the yellow striped bug, which destroys the young cucumber and melon plants. It comes as soon as the young vines come, and it stays all summer. Great numbers visit the flowers of the squashes and pumpkins for the pollen. The eggs are laid, and the grubs grow, in the ground. Those bugs which have their heads pinched off will be sure to do no further harm. Various devices have been employed against them, such as sifting soot, snuff, sulphur, ashes, or plaster of Paris, on the vines; sprinkling them with steeping of tobacco, red pepper, walnut leaves, or hops; burning fires of pine knots or bits of tar barrels at night, but none are sure. The best preservative is a frame of board, covered with millinet, to place over each hill of vines. If the plants can be protected for a little tim-

they will grow fast enough to escape further harm.

But my readers will begin to believe that all the Beetles are nuisances, and will be led to make war upon every insect which wears a hard shell. Let us find some for which something may be said on the credit side of the account.

While writing about ants, we mentioned those destructive little insects, which the ants use like herds of cattle, the plant-lice, or *Aphides*. The ants only milk their cows, but the grubs of a Beetle eat them up. These grubs become the pretty insects which people commonly call Lady-birds; naturalists call them *Coccinellidæ*. They have the size and shape of half a pea. Some are black, spotted with red; others, red with black, yellow with black, or yellow with white spots. The eggs are laid among the lice, and the grubs at once go to work catching and eating prey as large as themselves, without ever seeming to be satisfied.

This insect has always been a favorite. The

German children think it brings fair weather, and the English boys and girls are afraid to hurt it, lest it should bring rain. The Norwegians call it Marspäert, and count the spots to see if there will be a good harvest. If there be fewer than seven spots, they say bread will be plenty and cheap. The children sing:

Marspäert, fleeg in Himmel!
Bring my'n Sack voll Kringeln; my een, dy een,
Alle lütten Engeln een.

Marspäert, fly to heaven!
Bring me a sackful of biscuits; one for me, one for thee,
For all little angels one.

The Scotch children call this insect Lady Lanners, or Landers. They say:

Lady, Lady Lanners,
Lady, Lady Lanners,
Tak' up your clowk about your head,
And flee away to Flanners.
Flee ower firth, and flee ower fell,
Flee ower pule and rinnan well,
Flee ower muir, and flee o'wer mead,

Flee ower livan, flee ower dead,
Flee ower corn, and flee ower lea,
Flee ower river, flee ower sea,
Flee ye east, or flee ye west,
Flee till him that lo'es me best.

There are many other little rhymes in various languages, which show how children every where love this insect. Perhaps they do not know that it is useful as well as pretty.

The family of *Cicindelidæ* are called Tiger Beetles, or Sparklers. They get the first name from the fierce way in which they seize and devour other insects, and the last from their brilliant colors. The Tiger Beetle is among insects what the kite is among birds, or the shark among fishes. He runs with great speed; he is armed with jaws like sickles, crossing each other; his eyes project from each side of his head, that he may see every way; his wings help him to fly as swiftly as a wasp. His suit of mail, of burnished steel embossed with gold, is more beautiful than any thing ever wrought by mortal armorer. If placed under the micro-

scope in a strong light, his whole surface seems ablaze with precious metals and dazzling gems. The larvæ make their homes in the ground in tunnels about a foot deep. Here one of them lies in ambush just at the top of the ground, the head hooked to the edge of the hole. When an insect passes, the jaws grasp it, and drag it to the bottom of the den, to be eaten.

Another family of carnivorous Beetles lives in the water. Their breathing tubes open under the wing-cases. When they dive, they carry down under the wings a supply of air, and as this becomes exhausted, they rise, lift the wings above the surface, and so take a fresh supply. The larva of the Water Beetle is as active and as fierce as that of the Tiger Beetle, and the full grown insect does not outgrow his youthful tastes. If several be put in a vessel together, they will surely eat each other. A gentleman placed a pair in his aquarium in order to observe their habits. He succeeded in observing, on the next morning, that the male

had been killed and partly eaten by his disconsolate widow.

The whirligigs, that shoot from side to side on the top of still water, belong to this family.

One of the most noted Beetles is the Cucuyo, or Fire-fly of Mexico and Brazil. It wears on each side of the chest two light patches, which by day are pale yellow, but by night glow with a very intense light. When it spreads its wings, its whole body seems filled with the most brilliant flame. It flies by night, and the forests, filled with these insects, crossing and recrossing in every direction, glowing and vanishing as if suddenly lighted and as suddenly extinguished, present a scene too beautiful to be described.

The Indians catch these beetles by balancing hot coals in the air at the end of a stick, to attract them, which proves that the light which their bodies diffuse is to attract. Once in the hands of the women, the Cucuyos are shut up in little cages of very fine wire, and fed on fragments of sugar-cane. When the Mexican ladies wish to adorn themselves with these living dia-

monds, they place them in little bags of light tulle, which they arrange with taste on their skirts. There is another way of mounting the Cucuyos. They pass a pin, without hurting them, under the thorax, and stick this pin in their hair. The refinement of elegance consists in combining with the Cucuyos, humming-birds and real diamonds, which produce a dazzling head-dress. Sometimes, imprisoning these animated flames in gauze, the graceful Mexican women twist them into ardent necklaces, or else roll them round their waists, like a fiery girdle. They go to the ball under a diadem of living topazes, of animated emeralds, and this diadem blazes or pales according as the insect is fresh or fatigued. When they return home, after the *soirée*, they make them take a bath, which refreshes them, and put them back again into the cage, which sheds during the whole night a soft light in the chamber. In the full glow of one of these Fire-flies, it is easy to read a letter or a book. The little Flies which dart

through our meadows in moist summer evenings, are akin, though far less brilliant.

The last family we will mention, are the *Cantharides*, or Blister-flies. They secrete a substance which, when procured by itself, looks like fine snow-flakes; when it is left upon the skin it causes great irritation, and soon produces blisters. The Spanish Fly is nearly an inch long; its color is a satin green, glossed with gold. It feeds upon the ash and lilac, and is found also on the poplar, the rose, and the honeysuckle. Large quantities are taken, killed by fumes of vinegar, and exported for druggists' use. Several kinds of Blister-flies live among us. The Potato-fly, which consumes the vines at midsummer, is of this family. Another often strips the leaves from the clematis. These flies may be caught by shaking them from the vines into water, which prevents their flying, and when dry they may be used by the apothecaries.

AMPHRISIUS BUTTERFLY, CATERPILLAR, AND CHRYSALIS.

About Butterflies.

Articulata — Insecta.

Order — *Lepidoptera*. Scale-winged.

UGH! See that horrid, ugly worm!" Who has not heard such an outcry? Is there any good reason for the feeling which it indicates? We believe that the repugnance which very many really feel towards creatures of this kind is not, as they think, natural, or inborn, but is the result of early training. When the young mother sees her toddling baby busily watching a caterpillar, she bids him, with earnest words, with looks and accents of disgust, avoid the "horrid, nasty

thing;" his growing curiosity is checked, and darling Willie Winkie comes to believe that a worm or a spider is the vilest thing he can know, as confidently as he believes he loves his mother or his sister. Whoever has overcome the feeling, thus artificially acquired, long enough to begin the study of the forms, the nature, and the wonderful transformations of caterpillars of every kind, has learned that in this, as in all other departments of nature, the infinite resources of the creative power of God are wonderfully displayed.

Considering the entire round of the creature's life, the whole world of birds, insects, and flowers presents nothing more interesting or lovely. If nature's course is not disturbed, the worm will fly on wings of beautiful form, exquisite coloring, and most delicate plumage; the moth or the butterfly assuredly was, at some day not long since, a crawling worm. But we go yet farther, and confidently assert, that at no stage of its varied life does the insect show to the student so much that has interest or value, or

to the general observer much more of absolute beauty of color, symmetry, and adaptation, than when it is so often abhorred as a "horrid, ugly worm."

We do not deny that caterpillars of all kinds do much mischief. They eat, eat voraciously, and have the instinct to select the choicest parts of that on which they thrive. Most subsist on vegetable food, and chiefly on leaves; yet some devour the solid wood, some live in the pith, and some eat only grains and seeds. Some kinds attack woolens and furs; even leather, meat, wax, flour, and lard, nourish particular kinds of caterpillars. There is, then, no reason why they may not be destroyed, so that their numbers may be kept within reasonable limits. But we should not assert that the poor creatures are ugly, and then kill them because we have given them a bad name.

Let us see what we can learn by studying the lives of a few; we could wish that every reader, young or old, could have the specimens under

his own eyes, sure as we are that he would find more of interest in them than we describe.

In the month of June, when the feathery carrot leaves are growing well, we may find feeding on them a small worm, nearly black, which has perhaps grown to half an inch before we discover him; he may be no more than a tenth of an inch long. If none are seen on the carrots, we may search the parsnips, the leaves of the celery, parsley, or carraway, for the worm thrives on either. He is about as large as an oat-straw, and a little thickest just behind his head. He wears a clean, tight-fitting coat of black velvet, with a broad white band across the middle of his back, and another over his tail; the velvet seems to be laid over him in folds, and to be studded with small black points. If touched, he throws his head back quickly, as if annoyed at the impertinence. Tickle him with a straw, and he pushes an orange-yellow horn out from the top of his head, toward the side which was touched; tickle the other side, another appears. Both

issue from the same opening, and the two branch like the two parts of a V. They are scent organs. Immediately a smell is diffused, at first not unfragrant — like some kind of over ripe fruit — but soon sickening; by this odor he probably protects himself from the ichneumon-flies, which would else trouble him; and by it, also, you may know that your specimen is that which we describe.

You may gather a few leaves of the carrot, with the worm, and put them in any safe, airy place where you can watch him day by day; a supply of fresh food will keep him from going away for the present; or you may observe him on the plant where you found him.

In a few days he will quite likely cease to eat. If it were a canary, or a squirrel, which does not dispose of his rations, you might guess that your pet is sick, and so be anxious about him, but you need take little thought for the worm. He becomes restless. He twists quickly from side to side. Presently his skin bursts

just above or behind his head, and he actually begins to creep out of it. There, it is done. Your worm is yonder, in a new velvet jacket, several sizes larger, quite differently and more handsomely marked. It is arranged in cross-way folds, as before. On each fold the sober black is enlivened by several bright orange spots; on the middle of the back, where the white fold lay, is a small white spot, surrounded by six others, while three more are arranged a little lower on either side. The old garment, a shriveled, useless thing, lies there, where he crept out of it, after having fastened its hinder hooks to the leaf on which he rested.

Now he takes his food with renewed relish. He moves more freely, and seems much more at ease in his new and enlarged garment. For several weeks this process goes on. He eats, grows, outgrows his old clothes, and creeps out of them in a new and larger suit,—mamma, did you never wish Bobby could do so too, instead of wearing his trousers out at the knees, and kicking his toes through the copper?—

until after four or five weeks, and about as many changes, he is a full grown worm, or caterpillar. When at rest, he is rather more than an inch and a half long; when creeping about, he stretches more than two inches. The velvet coat is quite gone. In its place he wears a garment softer and smoother than the finest satin, or perhaps more like the delicate kid of which gloves are made, save that the worm's skin is far more delicate. The color is apple-green, paler on the sides, and whitish beneath; the bands are black, dotted with yellow spots, so placed as to form regular lines along his body.

In structure, our caterpillar is an example of all others. His body is made of twelve rings of tolerably firm substance, connected by softer bands, and covered with skin. Thus he has the most perfect freedom of motion. He can stretch or contract himself, can turn or twist in any direction, can roll into a ring, or straighten out stiff, like a twig of the plant on which he feeds, or conform to any unevenness of surface over which he may creep. His head is covered

with a flattened, shelly dish, provided on each side with six minute shining grains, which naturalists say are eyes. They do not say that caterpillars can see; Dr. Morris thinks "it is very doubtful whether they have the faculty of vision." One who watches a worm feeding, moving about, reaching out this way and that, quite ignorant of any danger that threatens, passing at the shortest distance the very thing which it seems to seek, never recognizing any thing except what it touches, and shrinking only when it is touched, can scarcely fail to conclude that, however many eyes the worm may have, it is, in fact, quite blind.

The mouth is armed with a pair of strong jaws, which open and shut, not vertically, like those of a dog, or a man, but sidewise. In the middle of the broad under lip is a small elastic tube, with a minute opening, whence comes the silk which it will some day find useful. In tropical countries the head is often queerly ornamented with spikes, prickles,

horns, and other things; those which we may see rarely have any thing of the kind.

Each of the first three rings of the body has a pair of jointed, tapering legs, covered with scaly or horny mail, and ending with hooks. These are the true legs. The worm has, besides, four to ten — usually eight — false, or pro-legs. These are thick, fleshy, without joints, but can stretch or contract like the body, are furnished at the end with a fringe of small hooks, and can take very different forms, as the animal wishes to cling by them to various surfaces. Caterpillars which have the full number of legs, that is, sixteen, have still four rings unprovided, the fourth and fifth, and the tenth and eleventh. The twelfth, or anal ring, has always a pair; the ninth has usually a pair; the other pro-legs vary with the species.

The motions of a large caterpillar which has the full complement of legs are deliberate and regular. First he stretches out the elastic body, and puts down the six horny

legs together; then the pair of anal legs take themselves up, and replace themselves close behind the pair of the ninth ring, shutting down upon the twig or leaf, as if made of India rubber; then the other pairs of pro-legs lift and move forward, the hindermost rising and falling first, and the others following in their order; mean while, motion seems to begin at the tail, and flow gradually and equably through the entire body, ending by pushing the head on for another stretch. The motion of such as have but one or two pairs of pro-legs is similar in fact, though different in appearance. The hind legs are drawn forward, and set down just behind the true legs, the body being thrown up into a loop; this loop straightened out, carries on the fore legs again. These caterpillars are called loopers, geometers, or measurers, since they seem to measure off the distance of their journeys. Gail Hamilton's gardener says they do so: measuring with his thumb and finger on his coat sleeve.

The looper caterpillars can not shorten or

lengthen their bodies like others, but only bend them. Some are round and stiff, of the same color as the bark on which they live. They grasp the stem or twig with their four pro-legs, while the body stands out stiff and motionless for hours together, and the observer mistakes them for twigs, or leaf-stems.

Each kind of caterpillar feeds by choice only on certain kinds of food, and most will refuse any other variety. They usually prefer leaves; after that, flowers; a few eat the pith of the stalk, and occasional species, the pulp of fruits. Most feed by night, and remain quiet by day, as if torpid; some are so voracious as to eat constantly. A silkworm devours its own weight of mulberry leaves, daily. Reaumur gave to a kind which eats cabbage, bits of cabbage leaf which weighed twice as much as their bodies. The pieces were consumed in less than twenty-four hours, while the worms increased their weight one tenth. What if a man weighing 150 pounds, should eat 300 pounds of food in a day, and gain 15 pounds of flesh!

When a caterpillar wishes food, it creeps out to the edge of a leaf, and twists its body into such a position that this edge passes between its legs, which hook on upon each side. It bites a mouthful from the edge, then another, and another, moving its head in the arc of a circle, and cutting in three or four bites, as a reaper would cut handfuls of grain with his sickle; the head moves back to the edge of the leaf, and begins another sweep; the fore legs move slowly on from time to time, until the caterpillar has stretched its body to its full length. Then the body draws itself back again, the pro-legs keeping their places, and the head cuts in again for a new swath. The pulp of the leaf is eaten down to the ribs, and often ribs and all disappear between the voracious jaws.

But we must return to our caterpillar of the carrot-leaves. When he has finished eating, he becomes uneasy. He no longer rests quietly on his leaf, or he moves only to find fresh pastur-

age; he begins to wander about, and if we do not shut him up, we shall lose him altogether. Presently we find him quiet again in some secluded corner at the top of the case; if he could, he would have found a retreat in a knot-hole, a crevice between boards, or an obscure nook under the fence rail. He now presses the elastic tube of his under lip to the wood; the silk material adheres to it; he draws his head away, and stretches a fibre of silk to another point, where he fastens it by pressing the fresh material against the surface. He crosses and recrosses the threads until he has covered a little space with a hillock of silk, to which he fastens himself firmly by the hooks of his hinder feet. Now clinging by his pro-legs, he bends his head back to about the fifth ring, and fastens a thread to the wood beside him. This thread he carries over his back, and fastens on the opposite side; he lays beside it a second, and a third, and in a little time has spun a stout band or loop of silk, in which he may rest securely.

How to Catch and Preserve Butterflies.

Any active, careful lad can secure a beautiful collection of Butterflies and Moths in a single season. For this he needs: a net; an ounce of chloroform, or sulphuric ether; pins; a setting-box; suitable boxes for keeping and displaying specimens.

Mosquito-netting is good enough for the net; make a bag about two feet long, and wide enough to be sewed to a light wooden hoop, twelve or fourteen inches in diameter, and fastened firmly to a handle about three feet long Or, take three or four springs from a discarded hoop-skirt; leave the cotton covering on; slip them through a hem made at the mouth of the net; have them project three or four inches beyond the hem at each side; break off the extra length, and then bend the projecting portions to a right angle; lay these pieces flatly against the handle and bind fast with smooth

wriggle, jerking itself from side to side. Its tail is yet in the folds of the caterpillar skin, which is hooked to the silk above. It must draw itself out of this remnant, throw away the cast off garment, and hook itself by its tail to the same place. We see now the utility of the silken band of our worm of the carrot leaves, but the hop worm has no such assistance. It has neither arms or legs — how can it do so much without losing its own hold, and falling to the ground?

The supple, contracting rings which cover its own body are the limbs which it uses. It seizes a portion of the skin between two of these rings, and so holding on, it curves the tail until it draws it entirely out of the sheath which covered it. But its body is shorter than before this change, and it must climb to reach the tuft of silk to which it should hang. It stretches its body as far as it can, and seizes the skin higher up, between two other rings, at the same time letting go below; this process it repeats with different rings in succession, until

between them. It is better to nail the strips together than to fasten them with cleats, because the joints hold the pins better. By a little care the grooves may be made of different depths, to receive specimens of different sizes.

Common brass pins may be used; needles of various sizes are better; best of all, the German pins made for the purpose, and sold by dealers in philosophical instruments.

The permanent cases are best of wood, tightly made, and glazed on one or both sides. When only one side is glazed, the bottoms may be fitted like that of the setting box, and should be lined with white paper. Bits of camphor should be fastened in them to drive away insects, or some fine day only a few wings, legs, and the dust of bodies will remain of the most valued specimens.

But little can be gained by striking at Butterflies on the wing. Find one which is resting on a flower, or on the ground; approach quietly, bring the net up carefully until quite sure of him, then turn it skillfully, and he is

shaped, and are usually white, yellow, or brown in color. In some, the threads cling very slightly; in others, they are closely gummed together; some are single, others double; some so closely woven as to quite hide the pupa within, others so thin that it may easily be seen; some bind together leaves, within which they hide; some work into the shell bits of earth; while some weave into the fabric the hairs with which their own bodies had been covered.

One variety pulls out its hairs with its teeth, lays them against the web already spun, and then fastens them by spinning more silk over, or, rather, under them — for the outside of the cocoon is spun first, and thickened from within. Another does not pull out its hairs; it cuts them off. Another works its hairs through the meshes of the silken net, and then wriggles about until it rubs them off. Another pulls them out in the first place, then sets them up like the stakes of a palisade, and spins a light

web within, curving them inward so as to form a sort of cradle.

Many caterpillars go into the ground to become chrysalides; there they make round or oblong cocoons. These are always smooth and shining within, and are often fitted with a lining of silk. Reaumur took a cocoon out of the ground, broke it open, and placed it in a glass case containing nothing but sand. In four hours the injury was repaired.

The caterpillar began by coming almost entirely out. It moved its head forwards until it could seize a bit of earth, which it drew into the cocoon; then it came out for another, and so wrought for an hour, gathering material. Then it began to rebuild the broken place. First it spun a band of loose web over a part of the opening; then it placed a few of its grains of earth in the meshes which it had made; it spun more silk, and put more grains in place, binding them together with silken cords. Presently the whole was closed except one small opening, which it filled with crossed

threads, and then finally stopped by pushing among the threads the bit of sand which it had saved for the purpose, and which made all tight.

A caterpillar found on the oak trees cuts off thin strips of bark, which it builds into two compact blades; these it so arranges as to form a hollow cone, or boat-shaped shell, in which it becomes a pupa. It is at once architect, cabinet-maker, and weaver.

In due time — sometimes in a few days, sometimes not until another summer, and in one instance, after as many as seven years — the time comes for the last, and most glorious transformation. The poetical Greeks found in this change a type of the liberation of the soul from its mortal tenement, and its entrance into a higher and happier life; hence they called the Butterfly, Psyche, the soul. This idea is most natural. The worm seems to spin its own shroud, to make its own coffin, often to enter its own grave. Yet within this shroud, this coffin, this grave, it lives, a

mant, waiting life, until the day comes for its resurrection. Then it bursts its cerements, and emerges in a new and beautiful garb, into a brighter existence. But the new life, unlike that of the soul, is brief and mortal; a few short days complete its round, and it perishes forever.

The pupa-case is dry, brittle, and easily broken. The least movement of the fly within opens the dry skin over the middle of the upper part of the thorax; the split extends over the forehead; the pieces separate, and the insect finds an opening through which it may escape. But the escape requires time, for the head, the antennæ, the wings, the legs, sometimes even the tongue, are each in a separate case, and must be liberated one by one. All the parts are soft and moist. The wings, especially, are a pair of crumpled packages, fastened to either side of the thorax. Gradually they unfold, they expand; the insect clings to a twig, and suffers them to hang in such a position that they may expand the more freely; in

time they become dry and firm. If the pupa is in a cocoon, there is yet more to be done, for it is still within the silken envelope. In some, as in the *Cecropia* moth, the end of the cocoon opposite the head is only partially closed, and the moth more easily creeps out. Others cut their way through the silk, for which, Reaumur says, they use their compound eyes as files. Others exude a liquid which softens the silk, and assists their escape.

The perfect insect has four wings, covered with minute scales of varied forms; these, under the microscope, glow with the most beautiful metallic tints. "Suppose a painter could present on his canvas, in all their splendor, gold, silver, the ruby, the sapphire, the emerald, all the precious stones of the East, he would use no color, or shade of color, which might not be found on some scales of some *Lepidoptera*, where nature has concealed them from our gaze."

The thorax, or chest, is strongly made, in order that it may give support to the wings,

and to the six legs. Many have the legs of equal length, and use all in walking; in others, the two fore legs are very short, and are kept folded back against the chest. The body is long, oval, composed of five rings, joined by membrane. The head is rounded, flattened in front, and furnished with hairs. The globular eyes consist of a great number of facets, on which, in different species, glitter all the hues of the rainbow. In the compound eye of the *Papilio*, more than 17,000 facets have been counted. The antennæ are placed near the upper border of each eye. Reaumur has figured six different shapes, and upon them the classification into families partly depends. What is their use? Certainly not for sight, taste, or smell. They are of little use as feelers, and there seems to be nothing else for them to do, which we can understand, except to serve as ears.

The jaws of the caterpillar have disappeared. Instead, the Butterfly has a long, flexible trunk, which it coils up into a small spiral, and carries

in a cleft just between the eyes. In some species of Hawk-moths, the tongue is longer than the whole body. It consists of three hollow tubes, a small one placed between two that are larger. Through it the insect draws honey and the juice of flowers. But how can it eat even the most solid sugar? On examination it appears that it sends down through one or two of the tubes of its trunk a fluid which dissolves the honey, or sugar, which is then carried back through the other tube.

After the Butterfly has found its mate, it lays its eggs, some hundreds or thousands in number, upon the plant which is the proper food for its young. They vary much in shape and color. Usually they adhere by a gummy substance; sometimes they are covered with the down from the abdomen of the mother, to protect them from cold, or injury. Some species place them in clusters; others scatter them, leaving only a few upon any single plant. In a few warm days they are hatched, producing

minute caterpillars, and the round of nature's course is completed.

Of the *Lepidoptera* some fly by day, others in the twilight, others still in the darkness of night. Hence authors have classed them as diurnal, crepuscular, and nocturnal. But this division is not found to be entirely useful, since some that fly by night fly also during the brightest and hottest sunshine, while even the night flyers do not fly all night. There are three principal sections.

First, there are the Butterflies. These fly by day, have club shaped antennæ, and when at rest, the fore wings in some, and all the wings in most, stand perpendicularly, turned back to back.

Second, the Hawk-moths. These fly, some by day, but most in the morning and evening twilight; they have the antennæ thickened in the middle, the wings narrow in proportion to their length, and confined together by a bunch of stiff bristles on the shoulder of the hind wing, which is held by a hook beneath

the fore wing; the wings, when at rest, are more or less inclined like a roof, the fore wings covering the under ones.

Third, the Moths. These fly mostly by night. The antennæ taper from the base to the end, and are naked, like a bristle, or feathered on each side; the wings are held together by hooks and bristles, the first pair, when at rest, covering the under pair, and more or less sloped.

Our space will not allow us to describe any of the many varieties of Butterflies and Moths which fly among us. The worm whose changes we traced from the carrot-tops, produces a large, fine Butterfly, called *Papilio Asterias*, which expands from three and a half to four inches. Its color is black; it has a broad band of sulphur-yellow spots across the wings, and a row of fainter yellow spots along the edge. The hind wings are tailed, and have seven blue spots between the two rows of yellow, and an eye-spot of orange, with a black centre.

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twine. The net thus made is very light, flexible, and convenient.

For a setting-box, any roomy box, of wood or pasteboard, two or three inches deep, will do. The bottom may be covered with thin sheet cork, pasted or glued down; or, instead, strips of corn-stalks serve to hold the points of the pins very well. Some strips should have a groove between them one-fourth of an inch deep by three-eighths of an inch wide, to receive the bodies of the larger specimens.

Where nothing better can be had, the bottom of the box may be arranged thus: get strips of inch board, about an inch wide, and as long as the box; if the edges are sawed smoothly, do not plane them, but smooth the upper surface, and plane off each upper corner; place the sawed edges of two strips together and nail them; then nail on a third, and so on, until a board is built wide enough to cover the box. The corners which were planed off now leave triangular grooves, while the sawed edges, though quite close, still allow the pins to pass

caught; hold up the bag, while the hoop is flat on the ground, the insect usually rises into it, and the folds falling over prevent the spoiling of the wings.

Now touch the head with a drop of ether, to stupefy him, take him out gently, put a pin through the thorax between the roots of the wings, and place him in the setting-box. As Izaak Walton says of using a frog for bait, "Use him as though you loved him." Arrange the feet as naturally as possible; then with a needle push the fore wings forward until their hinder edges lie nearly in a straight line — beginners do not usually bring them forward enough. Then lay over the wings on each side a strip of paper, or of card, and fasten it down at each end with a pin, which must not pass through the wings. Take care that the two sides are placed alike. Some specimens of each kind should be set upon their backs, to display the under surfaces. Leave them in the setting box until *thoroughly dry*, allowing two or three weeks for the larger kinds; other-

wise the wings will get awry, or droop, and the whole have an awkward appearance.

Ether, and chloroform, often fail to kill; some of the larger moths take large and repeated doses, and still live. For such, a little cyanide of potassium may be had, dissolved in water. A drop taken on a needle and pricked into the thorax under the wings, is merciful to the poor captive. Great care must be taken with this substance, for it is very poisonous when taken into the mouth.

Hawk-moths, and many others, fly very swiftly, and require great dexterity in their captor; take them when busy with a flower. Many moths may be attracted through an open window with a light. During the day they may often be found resting, head down, on fences, bark of trees, and elsewhere. Cover your specimen with a glass, slip a paper under, and take him away; a few drops of ether on the paper fills the glass with vapor, which suffocates the insect. Some of each kind of moth

should be set up, with wings in the natural position, as when at rest.

Set up a number of specimens of each kind, in order to secure a choice; four are always wanted to show the upper and under surfaces of both male and female. Reject at once all that are broken-winged, or otherwise injured, unless the species is rare, and then as soon as a better one is found. The collector secures his finest specimens by saving the cocoons, and taking the flies as soon as hatched, before they have had time to injure themselves. The cocoons should be kept through the winter in a cool place, in a roomy box; when the time comes for hatching, twigs must be provided, on which the butterflies may rest while the wings are expanding, else they may be hopelessly crippled.

Early in summer, get a candle box, and raise the lid about twelve inches, on strips of board nailed into the four corners; cover three sides of the open case with wire gauze, and fit a door to the fourth side. Fill the box with fresh

den mould, and set it away in a shady place. If a new caterpillar is found, put him in the case with *plenty* of *fresh* food. The inhabitants will not quarrel, and will usually thrive. When grown, some will descend into the earth; some will spin cocoons, and some will hang themselves up in the corners. Keep through winter in a cool place, away from mice, and watch the coming out of the insects in the spring.

A little patience and contrivance will do all we have described, and more, while much pleasure and instruction will be gained. Even this, profitable though it may be, should not be allowed to interfere with the performance of regular duty, whether work or study.

NOTE.—The general reader who desires further information concerning the species and habits of insects, will find "Harris' Insects Injurious to Vegetation," and the "Guide to the Study of Entomology," by A. S. Packard, Jr., now issuing in numbers in Salem, Mass., best suited to his purpose.

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